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ONE of the queerest cases in the legal experience of architects is that which a correspondent cites in another column, wherein an architect was actually arrested for embezzlement of his own plans, because, having disagreed with his client, he refused to give them up. We say his own plans, for, though this architect was carrying out work begun by another, and therefore, we presume, from plans made by another, he had succeeded by special agreement to the practice and professional equipment of the other, and the whole suit turned on the question whether an architect's plans are his own or his client's, — a question which is oftener raised, and makes a great deal more trouble, than there is any occasion for. If the question were once thoroughly examined in court, and a decision recorded by conspicuous acknowledged authority, it might be set at rest; for the matter is entirely one of usage, and the usage is so universal wherever the practice of architecture is systematically carried on that there can be no difficulty in ascertaining it. Unfortunately for this end it is very much the habit of courts, as of common men, to avoid the decision of any issues which can be set aside from a trial, and of the decisions that are made a great many, being on cases which are unimportant in themselves, whatever may be the importance of the principles they involve, are not put on record; so that they are useless for precedents. Thus, in the case before us, the court before which the first trial was held only decided that, there being no evidence of an attempt to defraud, the criminal suit must be dismissed, leaving the question of ownership to be carried up in a civil suit before a higher court. We have discussed this subject before (*American Architect*, June 15, 1878), noting the unmistakable custom which prevails, with the reasons which lie at the bottom of it, and have expressed regret that a usage so important and so easy to establish should have thus far so slender a recognition from the courts to show. We may trust that in Mr. Tolman's case the question will be thoroughly examined and the usage inquired into by the court. In order to help in setting forth the matter clearly, and to take advantage of what judicial decisions may be within reach, we would suggest to our readers to communicate to Mr. Tolman, or to us — or to both — any decisions or cases bearing on the question at issue of which they may be aware. In this way they may lend a hand in clearing the practice of their profession from one very needless cause of disagreement with inexperienced clients.

EXCEPTIONAL cases will come to mind which do not fall under the general rule, but which do not invalidate it. The celebrated case of Mr. Edward Barry against the English Commissioners of Public Works was decided on grounds which do not apply to ordinary work, the usage, as we understand it, having been simply overruled on the ground of state necessity, as it were by law of eminent domain. Where architects are salaried officers of city or state, and the running expenses of their offices are borne by the city or state, the drawings which are made in these offices, like the rest of their working equipment, belong naturally to the employer, that is, the public. But even in the case of a government architetct, the claim has been advanced, and we believe allowed, that the architect's own sketches, made to help the operations of his mind, and not for use in carrying on the work, were his own, and need not be surrendered to the government. It is worth while, perhaps, to repeat here a caution which we have given before: that it is desirable for architects in making out their bills for services to avoid a form which is sometimes used, and not to render bills "for plans and specifications." This form would be equivalent to a bill of sale, and, assuming that the plans and specifications were originally the property of the architect, would transfer the title to the client who paid the bill. It is a form that we suspect is often used inconsiderately, but it would be better to use the form which more careful architects adopt, as do other professional men — "for professional services," — or, if items are demanded, to include, "for the use of plans and specifications." Several inquiries which we have lately received make it seem worth while to reprint, as we do in another column, the tariff of charges recommended by the American Institute of Architects. We will add, to avert a misunderstanding which seems to be not uncommon, that the tariff is not an enactment of the Institute, intended to prescribe a rule for the profession, in which case it would simply be a trades-union decree, addressed to the allegiance of members. It is merely a recognition by the Institute of the scale of charges usually and lawfully made by architects in this country and in Europe, to which the Institute recommends that its members, like other architects everywhere, should conform.

IN the late Sir Gilbert Scott's posthumous Recollections, edited by his son, and just published, there is a suggestive passage which indicates, or marks to those who were aware of it, a noteworthy difference between himself and his great rival in modern Gothic work, Mr. Street, in their ways of carrying on work. Sir Gilbert, as is pretty well known, being the most popular architect of his day and nation, had more work on his hands than any one man could fully follow in its details. It was understood that in the carrying out a great deal was left to his subordinates, and in these Recollections he lets it appear that his system was contrived to take full advantage of the capabilities of those who worked under him in sparing his personal care, — a system which often naturally led to a more or less unsatisfactory result. He complains that his carvers, glass painters, and metal workers were apt to work after their own fancies, and to do things for him that he did not like; that much unsatisfactory carving, for instance, was done on his work, and that sometimes it was "detestable." He compares his manner of working with Mr. Street's, and after remarking the improving effect of both on the English carving of the day, he says of Mr. Street, "He can lay claim to his more personally than I can to mine, as he gives drawings, while I do my work by influence; but the results are in both cases of a high order." The long and short of this is, we take it, that Sir Gilbert allowed his subordinates to supply their own ideas, which he influenced, to use his own word, by his criticisms, while Mr. Street prescribes everything. It is known, in fact, to be the habit of Mr. Street, a draughtsman of rare facility, whose use of his pencil is incessant, to provide his draughtsmen with sketches for everything, and even to the last detail, from his own hand, — a habit which is almost unexampled among architects of very large practice, but which gives completeness of character and individuality to an architect's work as nothing else can.

THESE two ways of carrying on work are typical. It will always be an open question how far an architect shall originate, or how far only control, the decorative details of his work, although in our day the most capable men are apt to carry their personal care farthest in the designing of detail. Carried out to a logical extreme, the difference marks a broad distinction, which separates architecture, as Mr. Ruskin has somewhere remarked, into two great divisions, the types of which are classical architecture and the styles which imitate it on the one hand, and mediæval on the other. The classical styles, indeed, are an extreme instance. Classical work was in many cases so designed as to allow every detail to be prescribed with an exactness and uniformity which one designer could easily control, and which, requiring nothing but mechanical training in the workman, left absolutely nothing at the mercy of his capacity if once his skill of hand were assured. Mediæval work, on the contrary, in its most characteristic development, gave scope for endless design of individual workmen. The ideal of modern architects has been to approximate as closely as possible to the extreme classic practice, and to pre-

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scribe every detail with minutest care; but in reality they differ greatly in their degree of approximation, and many are necessarily very dependent on the design of subordinates. This ideal way is naturally the most effective in giving to skilled design the entire harmony which comes of having every detail thoroughly in keeping with every other and with the whole; but it requires either that the work shall be designed in a style which by its formalism and repetition reduces the workman to little more than a machine, or that the architect shall confine himself to a very little work, or finally that he shall have such a working power as belongs only to a very few exceptional men. The other procedure belongs more naturally to styles which depend on fulness and variety of detail; and it generally leads to the sacrifice of something of the perfect ensemble to these. But it allows a single architect to do an amount of work which is only limited by his administrative ability or his opportunities. It can be successful only when there exists a body of workmen trained to design in their own field, as well as to work, informed with a common feeling, and trained in a uniform way and to a uniform pitch of excellence that will give to the work of all a natural unity.

This condition of things existed in the Middle Ages, but it has hardly existed since. In modern times it is seldom possible to carry out a large work with satisfactory unity where much independence is left to the individual artisans. No doubt the abstractly perfect condition is one in which every artificer may be trusted to design his own decorated fragment of a building, so that the workman may be in his own way an independent artist, while the whole does not suffer. It is this system that develops the workman to the highest point, and makes the most of a man of him; so that politically and philanthropically it is most to be desired. But it is almost hopelessly at variance with the modern tendency to eclectic design, since it can hardly succeed except when men are working together in one style with which they are all instinctively familiar, a condition of things which is the opposite pole from eclecticism, and from which we are very far at present. Where, as is too often the case, the different artificers are left nowadays to their own devices, the carving, the painted decoration, the glass and metal work are sure to be joined in a life-long quarrel. Even where an architect has supervised the whole he can seldom secure more than mutual tolerance among the different kinds of work unless he designs every detail himself. So much success as Sir Gilbert Scott achieved in his way is only possible where a large force of workmen has been painstakingly trained, as this generation has been in England under the Gothic revival. No modern nation has yet carried such a training to the point of a really satisfactory unity; whether it lies in the direction of our present progress is questionable. However much it is to be desired, at present the most really successful work is done on the other plan.

There is some natural appropriateness to an era of bursting steam boilers in the ordinance now pending before the St. Louis municipal assembly to legalize the inspection of boilers by insurance companies, ordering that the inspection of insurers shall be accepted in lieu of the official inspection required by the city, and also requiring that engineers and their assistants shall submit to examination and take out licenses. The arguments are that the city inspection is only required once a year, and is made only by the hydraulic test, which is fallacious, and may weaken boilers dangerously; that the insurance inspections are more frequent, being made every four months; more careful and thorough, being made by companies which have a risk in the boilers; and safer, because for this hydraulic test they substitute a careful examination of the boiler by mechanics, inside as well as outside. That the ordinary official testing is too superficial to be of much value is true enough, and it is very desirable to substitute something better. It is our opinion that no boiler should be used at all which is weak enough to be injured by the usual hydraulic test; but still, if a weak boiler is allowed to be used, it is certainly better that it should not be made weaker in testing. It is quite likely that an insurer, who had an interest in the safety of a boiler, would make a more searching examination than the ordinary inspector; and so far something might be gained by the proposed change, provided it were insisted on that the boiler tested should be one actually insured by the examiners, as a guaranty of good faith and thoroughness. But what is really wanted is some radical change in the methods of testing, as well as a raising of the ordinary standard of construction, which has been steadily going down for a number of years, and a greater margin of safety than is commonly provided. The usual methods of inspecting, including the hydraulic test, allow only for the steady pressure to which a boiler is to be subjected, and make no account of the sudden shocks to which it may at any time be exposed by accident or careless handling, which there is every reason to believe are the cause of most of the explosions that occur, and many of which probably could be withstood by boilers that were as strong as they ought to be. One point is that boilers should be tested in the beginning through careful examination by sample of all the iron that goes into them, with reference to its behavior at different temperatures. If this were done, and if a record were kept of their history, a great point would be gained in favor of safety. And if they were run by even tolerably competent persons, there would be another chance in their favor. At a hearing of the manufacturers of St. Louis, a considerable opposition was made, it is said, to requiring an examination or license of engineers. What real objection there can be to demanding license or examination, or any other effective qualification, for the men who are to have a special opportunity of destroying our buildings and lives, we do not know. To be sure, it might possibly raise their wages by checking the supply of incompetent persons.

We notice that Senator Burnside's joint resolution apropos of the Inter-Oceanic Canal declares, by virtue of the Monroe doctrine, that "the people of these States would not view without serious inquietude any attempt by the powers of Europe to establish under their protection and domination a ship canal," etc. We, as non-political editors, have no business with the Monroe doctrine, nor do we know whether the resolution has a chance of passing. It occurs to us, however, that the private capitalists of foreign nations, who are more likely to build the canal than any one else, need not be deterred by an expression of feeling like this, provided they have the encouragement of the states through whose territory the canal is to pass. Or if a canal project seems important enough to command the support of nations, it will be more important to our nation than to any other, and a good way to avoid this unpleasant inquietude would be either to join heartily with other nations in building the canal, and so preserve our right in it, or else take it in hand and build it for ourselves. The sound of such a resolution from a nation that stood aloof from the undertaking would be a little like the bark of the dog in the manger.

This time it is Captain Eads who comes forward with the proposition to transport steamships by rail across the Isthmus of Darien, instead of cutting the canal through it. In a letter to the New York *Tribune*, he argues that to construct a ship railway would cost only a half or a third as much as to build a canal, and would take only a fifth as long. He thinks, moreover, that the transit would be quicker, not occupying more than twenty-four hours; and that the cost of working the railway would be "considerably less in proportion to the tonnage moved over it than that of the most successful railway line in this country," a thing which would depend greatly, we should think, upon the amount of use that was found for it, and the length of the road that was compared with it. Captain Eads's plan does not differ materially from others of like kind that have been suggested, but is explained more in detail than most of them. He proposes to carry his ships across, not in tanks, but upon platforms or cradles, which would be made in sections a hundred feet long, and put together in lengths to suit the size of the vessels. The ships would be floated upon these, and raised to the level of the track in locks, or by hydraulic rams. The cradles would run on eight or ten parallel rails. Each section would be supported on some two hundred wheels, part of which would be driving-wheels, themselves driven by engines incorporated in the cradles. These wheels would carry each about twelve tons when the cradles were loaded to the full, which is about twice the weight borne and transmitted to the rails by the driving-wheels of a locomotive. A dozen freight locomotives, or their equivalents, he thinks, would be enough to carry the largest ship and cargo over grades as steep as those that are used in ordinary railroads, and at a speed equal to that of an ordinary freight train, though he would not count on a speed of more than eight miles an hour. Captain Eads does not give any estimates for the comparative cost of maintenance of a railway and a canal, but assumes rather loosely that

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if by his project the cost of maintenance should be half the gross receipts, the investment would still be more profitable than a canal. We will not argue against the practicability of a plan brought forward by the successful engineer of the St. Louis bridge, but it should be remembered that the data for computing the cost of such a railway as he proposes are less trustworthy even than for a canal; that a great undertaking of an entirely new kind is apt to be much more costly than it is expected to be; and that permanency of construction and ease of operation are advantages which, in such a scheme, outweigh a very great difference of first cost, so much so that, except where a great saving of time is to be gained, a costly canal is a more economical means of transportation than a cheap railway. In this last respect it is difficult to see that a ship railway across the isthmus could bear any comparison with a canal.

LORD DUFFERIN'S proposal to secure the land which borders Niagara Falls on both sides for an international park, to which we referred the other day in discussing Sir William Thompson's counter proposition, and which was commended to the legislature of New York, last winter, by Governor Robinson, may yet come to be realized. It is reported that the State Board of Survey, to whom the matter was referred by the legislature, will meet the commissioners appointed by the Dominion of Canada some time in this month, and that they are likely to report jointly in favor of the park. Mr. Gardner, the director of the New York State Survey, and Mr. F. L. Olmsted, it is said, have carefully examined the lands on the American side, with an eye to the proper limits of the park land and compensation for it. The owners of the land, finding that they have been spoiling their own market and making the Falls unpopular by the series of petty exactions with which they have hedged in the approaches, appear to favor the new plan and to enjoy the prospect of selling their rights to the State, if they can do it at their own prices. A correspondent of the New York *Times* reports estimates of the cost of the land and improvements that are likely to be taken on the American side, which differ according as they come from owners or non-owners, ranging from half a million dollars to a million, and even a million and a half. The commissioners are expected to recommend taking possession of the shore from Goat Island Bridge to the Suspension Bridge, including the whole of Prospect Park. The amount of land to be taken on the Canadian side is put at forty acres, and its cost at two hundred thousand dollars.

THE HYPÆTHRAL QUESTION.[1] III.

THE Pantheon of Rome affords an isolated exception, it is true, of the light of day being introduced into an important building through an opening in its roof, which was necessarily, at the time of its construction, and which has since remained, unglazed and uncovered. But it proves the rule. The reasons which led to the exception are evident, and their consideration may throw light upon the subject, if it does not render the adoption of an hypæthron for Greek temples extremely improbable. The Pantheon consists of a hemispherical dome of brick and concrete masonry, supported upon cylindrical enclosing walls, whose height is nearly equal to the radius of their vaulted ceiling. The interior height of the building itself is thus the same as its diameter; an inscribed circle, the upper half of which is coincident with the sweep of the vault, would be tangential to the horizontal floor line. Never, probably, was there a structure with so great a proportion of its cubical contents surrounded by its covering, enclosed by the inclined lines of its ceiling and roof. This peculiar form is probably due to its original destination as a laconicum or hot room of the Baths of Agrippa. It was of circular plan that the heat and steam might be equally radiated; the opening in the apex of the vault, now the entrance for light, was then an escape governed by a bronze plate (clipeus), which was so suspended by chains as to be raised and lowered at will. As it was raised the temperature of the room fell, because of the freer passage allowed the ascending warm air; when it was nearly closed the heat was increased. These Baths of Agrippa were the first erected in Rome, and the architect was naturally obliged to experiment somewhat upon their arrangement. The great laconicum succeeded so well, was so majestical in its proportions, and so harmoniously developed, that it appears to have been before long devoted to the service of the gods as a Pantheon. The opening in the vault, the form and position of which had been decided by its original service, remained as an opaion for the admission of light to the fane. All the great vault above the interior cornice, a space of equal height with that which remains below, could not have received direct light without an orifice of some kind in the dome itself. Vertical windows in the enclosing walls would not have sufficed, as too large a part of the interior would have depended upon reflected light for illumination. With the high position of the noonday sun in the latitude of Rome, the rays falling at but a slight deviation from the vertical would, after passing through side walls of enormous thickness, have struck but a small surface of the pavement, — never the opposite wall: the dome above would have remained in darkness.

Even if the preceding explanation of the origin of the opening in the dome of the Pantheon be rejected, the great temerity of erecting for the first time a circular vault of so vast a span must be considered, and the additional difficulty which would have ensued from the adoption of side windows. The builders of the Pantheon, daring experimenters as they certainly were, could not but have feared to weaken the supports of the dome by cutting from its side walls the enormous amount of material they would have been obliged to displace to form window openings in sufficient size and number to serve even for the floor alone. The mere existence of the building, after so many centuries, and the attacks of earthquakes, conflagration, and thunderbolts, proves the exceptional care taken to render its construction secure. The lower portion of the rotunda was, moreover, partially surrounded by other walls, by its own great portico in front, and by other rooms of the Agrippa baths at its rear, an enclosure which would have interfered with a free arrangement of windows in the drum. In all, nearly one half of the periphery was thus built in. It is evident that, unless the important dome was to be left in great obscurity, some opening through it, some hypæthron, was unavoidable. The remodelling architect had no prototype for such a horizontal window, other than the original opening of the laconicum. Its retention was natural, and in many respects satisfactory. It gave a sufficient and comparatively unvarying light to the dome; by omitting a part of the vault, the incumbent weight was diminished, while the supporting and enclosing walls were left unpierced, thus retaining their ideal character of securing entire separation and isolation from the world without. The manner in which the opening was left, a simple, unprotected void in the apex of the vault, savors, it is true, of a first trial, and has not since been repeated; it was incapable of further development by later builders.

The Pantheon has often been characterized as the most un-Greek of all Roman buildings. The fundamental difference, which gave rise to all others, and in the first rank to the different method of lighting, is the curved roof of stone which took the place of the horizontal timbered ceiling and inclined roof of the Greek naos. The architectural character of any people, or of any period, is most definitely decided by the manner of roofing adopted. It is clear that no unbroken vault or dome of great extent can be well lighted solely by windows beneath the impost of its lateral supporting walls. The few existing examples where this has been attempted do but show this truth by their ill success. The usual method is to break through the main vault or dome by smaller intersecting vaults, carried up to a sufficient height above the spring of the main vault to admit of the lighting of that space by upright windows. This is so effectual, that its application has for centuries been universal where inclined and vaulted ceilings are employed. Such vertical openings may be observed in the dome of St. Sophia, where, although the ceiling is an arc smaller than a half-circle, and the space below is so much greater in proportion to that of the Pantheon that sufficient light might be supposed to enter through the vast openings in its high walls, there was yet the necessity of direct light to the dome itself. The intersecting vaults are small and numerous, giving, by their great number, an equable light, and so formed as to allow the openings to be protected by upright perforated slabs of stone. This method of rendering the light-openings into a circular dome vertical, instead of inclined or horizontal, is exceedingly ingenious, and if known before the Christian era would certainly have been seized upon by the remodelling architect of the Pantheon, for whom light was so imperative a necessity. It was reserved to be the advance of a later age. Every enclosed space should receive direct light, and the opaion was the only method then known by which the problem could be solved.

In a horizontal ceiled hall, such as the Greek naos, an opening in the covering is not sufficient; the corners, which are formed by the walls, and whatever portion of the ceiling is suffered to remain, can never be directly lighted when this latter is horizontal. Side windows alone can entirely illuminate such an enclosure. Why no window openings were left in the naos wall, where, under the outstanding ceiling of the pteroma, they would have been comparatively protected from the elements, is incomprehensible, if it be supposed that the sacred interior was destined to be reached at all by the rays of the sun. Windows under the pteroma could have received a fitting architectural development, which it would be impossible to give an opening in so disadvantageous a position as is usually assigned to the hypæthron. When it was intended that daylight should enter the Roman temples, there were windows in the side walls; that these never occur in Greek temples is a proof that daylight was not desired for the naos, — that the illumination of the interior must have been artificial.

I may propose it as an architectural principle, that, when a space is to be lighted from above through openings in its covering, roof and ceiling must then fall together as one and the same member. This is the case in the Pantheon, in St. Sophia, even in the Walhalla, which, with all its desire to be Hellenic, was obliged to forego a ceiling. Von Klenze's hypæthral Doric temple, departing as it does

[1] Papers of the Harvard Art Club. No. 1.

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from the true principles of Greek architecture, while assuming its form, is interesting and instructive on that very account. The inclined lines of its roof had to be shown within, notwithstanding the employment of an iron trussed frame and the modern *pons asinorum* of glass, as a building material. For temples lighted through an opening in the roof, a ceiling would have been a worse than useless feature. If the shaft which would have resulted between it and the roof had been boxed up, this would have formed an ugly feature, intolerable because the interfering ceiling would have had no significance or function, because the method of introducing light by a chimney cut through the attic roof space is contrary to common sense. If it had been left open, and the eye had been allowed to look into the roof framing, the effect to the observer within might have been more tolerable ; but rain would have been carried into the most inaccessible parts of the structure, there to cause the decay of the timbering, if not more expeditious damage, by dripping through the ornamented ceiling of the hyperoon. When inclined roof and horizontal ceiling become separate features, as they do fundamentally in Greek architecture, then the admission of light through them is not to be thought of. Galleries in rooms lighted from above are liable to the same objection that has been made to horizontal ceilings : they impede the light, which in Doric temples could never have fallen directly upon the side walls. Galleries had therefore to be omitted from the Walhalla, wisely for the hypæthral theory, as in that building, which is generally visited by daylight, their gloom would show the disadvantages of horizontal projections under vertical light, clearly as do the galleries in the Munich Odeon when seen during the dreary daylight rehearsals which precede the brilliantly lighted concerts of the evening. Hyperoon galleries existed in all those Greek temples which are now assumed to have been lighted from above. The problem of lighting such temples was in every way the opposite of that presented by the Pantheon, where every horizontal projection is avoided. There is no point of the floor, walls, or great dome of the Pantheon, from which the sky cannot be seen through the opaion; this would be true of but a very small part of the Greek temple floor if the light came from above. The roof-opening of the Pantheon is so far from the side walls that no rain could possibly fall upon them, the horizontal distance being about seventeen metres, while in the temples it could have been but one or two metres, at most, from the edge of the hypæthron to the gallery. The slightest slant of the in-falling rain would thus have carried it upon the hyperoon, from whence it would have dripped upon everything in the interior. The imaginary opening through roof and ceiling must be made ample, from its disadvantageous position; a mere chimney-like shaft would not have sufficed to admit adequate light to the interior. The Walhalla is empty ; there is nothing whatever in it to absorb the light; its walls and floors are of polished and reflecting marble. It has a large window in the open opisthodomos, no ceiling, no galleries to cast shadows within, and yet it is barely light enough with eighteen per cent of the roof cut out.

Applying this proportion to the Parthenon, which was in every respect a building more difficult to light from above, it necessitates an opening which, if made symmetrical to the enclosed space, would be no less than seven by seventeen metres. When such a piece of the roof is cut from off the main apartment of the temple, from the very heart of the structure, from that which alone it seems important to protect, the question suggests itself whether the fragment which would remain might not well be entirely abolished, and the building stand altogether roofless. How devoid of reason would be the disposition of the whole temple if covered as now generally supposed. Pteroma, pronaos, and epinaos would have been carefully roofed and ceiled, while within these vestibules an unprotected space was left a mere hollow court. Surely our conception of the truth and thoughtfulness in the architecture of the Greeks is amiss, if such a structure be the highest Hellenic ideal of a sacred fane. Such being the relation of the hypæthron to the interior, let us consider its appearance on the outside. The aëtos or gable roof is in itself so complete a feature, that any such opening would seem to be actually cut out from its material, or the failing ridge to be crushed and broken in. Openings on the corner of a building are always avoided, as the constructive tie, which in such points is most necessary, is destroyed, but the ridge of the roof is no less important than the angles of its supporting walls. The exterior could not be said to gain by the adoption of an opening at this point; the sky line would be entirely disfigured, and the orifice would have the effect of an unsightly notch bitten out of the most important line of the entire composition.

When one first studies modern works on Greek architecture, it is a matter of surprise that there are so few representations of the hypæthron. In fact, it is so difficult to ascribe to the Greek designer such an affront to the fundamental laws of architecture, that but few hypæthral restorers clearly show their intention by adequate illustrations. The plans which have been published do much to refute each other, and but little to prove their own correctness. I may, of course, be excused from even mentioning those reconstructions which suppose the naos covered with translucent tiles or roofed by the perforated segmental, elliptical, or semicircular vaulted ceilings, proposed by Cockerell, Quatremère de Quincy, and Falkener.

A disinclination to break into the ridge, combined with other difficulties attending the arrangement of a mere hole through roof and ceiling, has led an eminent English writer on architecture to adopt another manner of procuring daylight for the interior, which, for the sake of a complete consideration of the subject, should be mentioned.[1] I say adopt, for though Mr. Fergusson is evidently proud of his opinion,[2] it did not originate with him, — at least he was not the first to publish it, — it having been suggested by Boetticher some years before its first appearance in England. That writer did not, however, endeavor to prove its possibility, and the opinion may still be peculiar to Mr. Fergusson. The theory supposes another story over the hyperoon of the naos, a clerestory so to speak, pierced with vertical windows, through which the desired light could fall. The advantages of this over the simple hypæthron are evident. There is a complete ceiling over the naos, as well as over the galleries; the addition above the ceiling line is not of the disagreeable pentagonal form peculiar to the other opening; and there is a roof above the interior which would prevent, at least, the direct in-fall of rain. But the system of clerestories is so foreign to Greek methods of temple building, that it is, at least, extremely improbable that such an expedient was employed. It does not even agree with the only authority for any opening whatever. Vitruvius says *sub dio* and *sine tecto* distinctly enough, and furthermore, in another part of his book, in the account of what he calls Oeci Egyptii, describes just such a clerestory as Mr. Fergusson recommends.[3] If Vitruvius had meant such a structure to be imposed upon his roofless naos, he would surely have there referred to it. Every one who reads Vitruvius with attention will observe that, in all his descriptions of temples, nothing whatever of this kind is mentioned. When he comes to speak of buildings for public and private assemblage, the clerestory appears as a new form, necessitated by their destination. Applied to the Parthenon, such a third flight gives a masked construction foreign to Greek architecture, — causes the building to seem inwardly a basilica, outwardly a horizontally ceiled temple, — thus agreeing as little with the history of the art as it does with the demands of good taste. Such an arrangement would, moreover, surely have left some traces which would have been allowed to stand by the remodelling Christians, who could well have retained it in the Parthenon if it had there existed.

In a line with this is the restoration recently proposed by M. Hittorf,[4] and advocated by M. Chipiez.[5] It is exposed to the same objection; though, as leaving the principal aisle of the naos of its natural height, and introducing the light from a lower level, it is perhaps preferable. But the hyperoon galleries are rendered useless by the light shaft above them, and M. Hittorf's suggestion must be considered as improbable as it is ingenious. Both these restorations leave long and ugly furrows in the roof, into those of the first of which, especially, a great part of the fall of water upon the temple would be led, thus necessitating complicated gutter constructions, which are entirely strange to the simple and straightforward methods of building employed by the ancients.

J. T. Clarke.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK. MR. R. M. HUNT, ARCHITECT.

The third story contains, as in many of the other designs, the private chambers and appurtenances for the use of members.

EPISCOPAL CHURCH AT COLDBROOK, NEAR ST. JOHN, N. B. MESSRS. R. BROWN AND J. C. ALLISON, ARCHITECTS, NEW YORK.

This church, which will be built shortly, will accommodate one hundred and thirty-two people. It will be built of wood with an open-timber roof. Two thicknesses of boarding are nailed to the purlins, then a covering of shingles. The cost of the work, including seats, pulpit, and reading-desk, will, according to estimate, received, be $1,793.

PLAN AND CALCULATIONS FOR A SYSTEM OF FORCED VENTILATION FOR SCHOOL-HOUSES.[6]

In a paper on Forced Ventilation I had the honor to read before this Society some time ago, I mentioned the great importance and advantages of such a system of ventilation, but at the same time the great difficulties which present themselves, when we intend to use it in a common dwelling or school-house.

That the ventilation in school-houses, and other buildings where a large number of persons assemble, is bad, is a fact generally admitted. In the reports of the school superintendents of the different States to the United States Commissioners of Education we find a general complaint about defective ventilation, and expressions as follow are common: "We have no good system of ventilation;" "School ventilation is thus far a failure;" "The air in our school-rooms is simply execrable;" "The smell of a primary school has become proverbial;" and similar expressions. The bad air and fearful mortality in large tenement-houses is equally well known. As an illustration of the general and most culpable neglect of ventilation in school-

[1] *True Principles of Beauty in Art*, 1849.

[2] "In sixteen years more it may probably find its way into books or architecture, or earlier, if I die meanwhile." *History of Architecture*, 1865, vol. i., p. 241, n.

[3] Lib. v., c. vi.

[4] *Architecture Antique de la Sicile*, 1870.

[5] *Revue Archéologique*, 1878. A translation of the paper by M. Chipiez is to be found in the *American Architect and Building News*, January 11 and 18, 1879.

[6] Read before the Alameda County Medical Association, February 11, 1879, by Henry T. Legler, M. D.

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PLAN OF SECOND STORY
PLAN OF FIFTH STORY
PLAN OF FIRST STORY
PLAN OF FOURTH STORY
THE HELIOTYPE PRINTING CO 220 DEVONSHIRE S. BOSTON

DESIGN FOR UNION LEAGUE CLUB-HOUSE.

R. M. HUNT, Architect.

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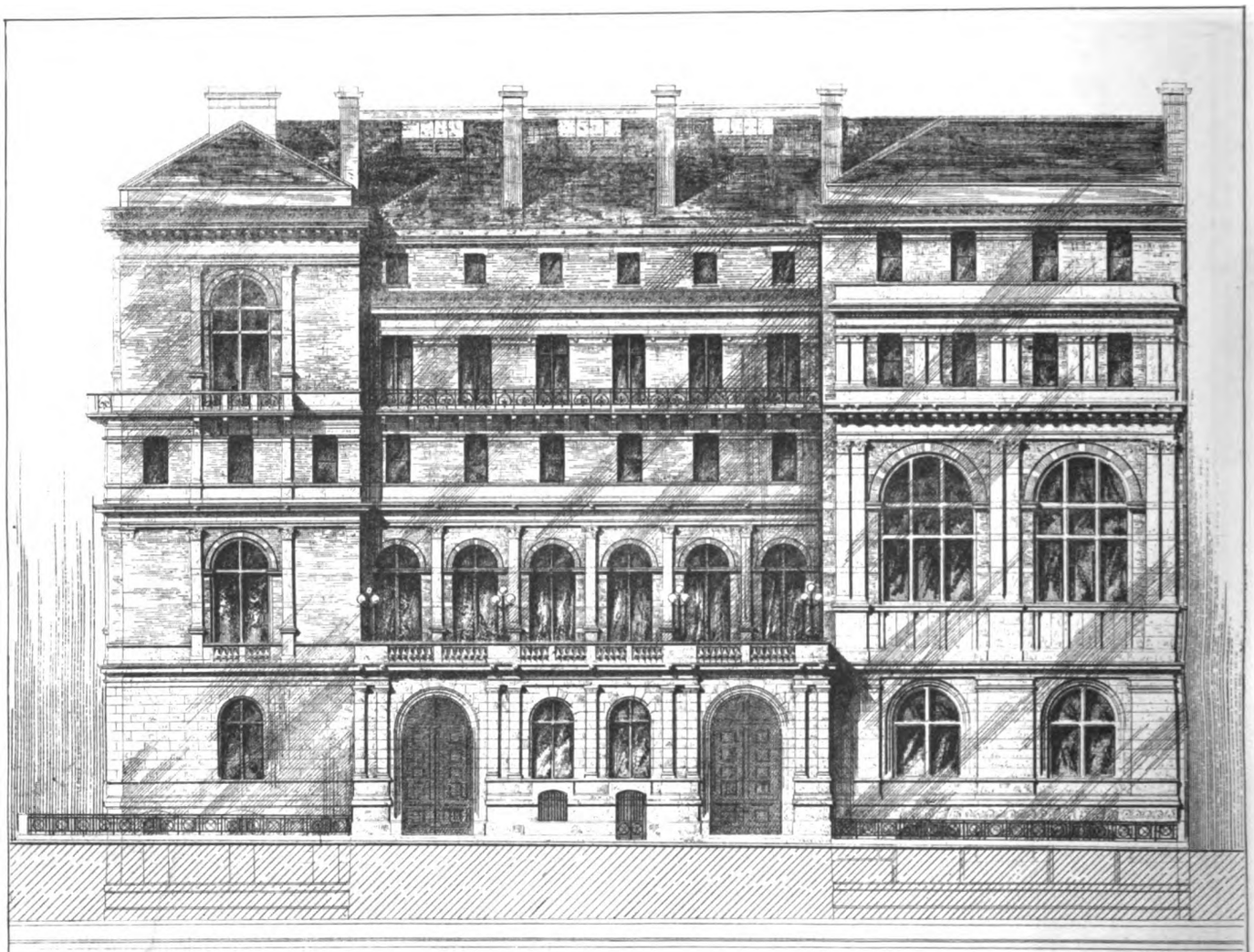
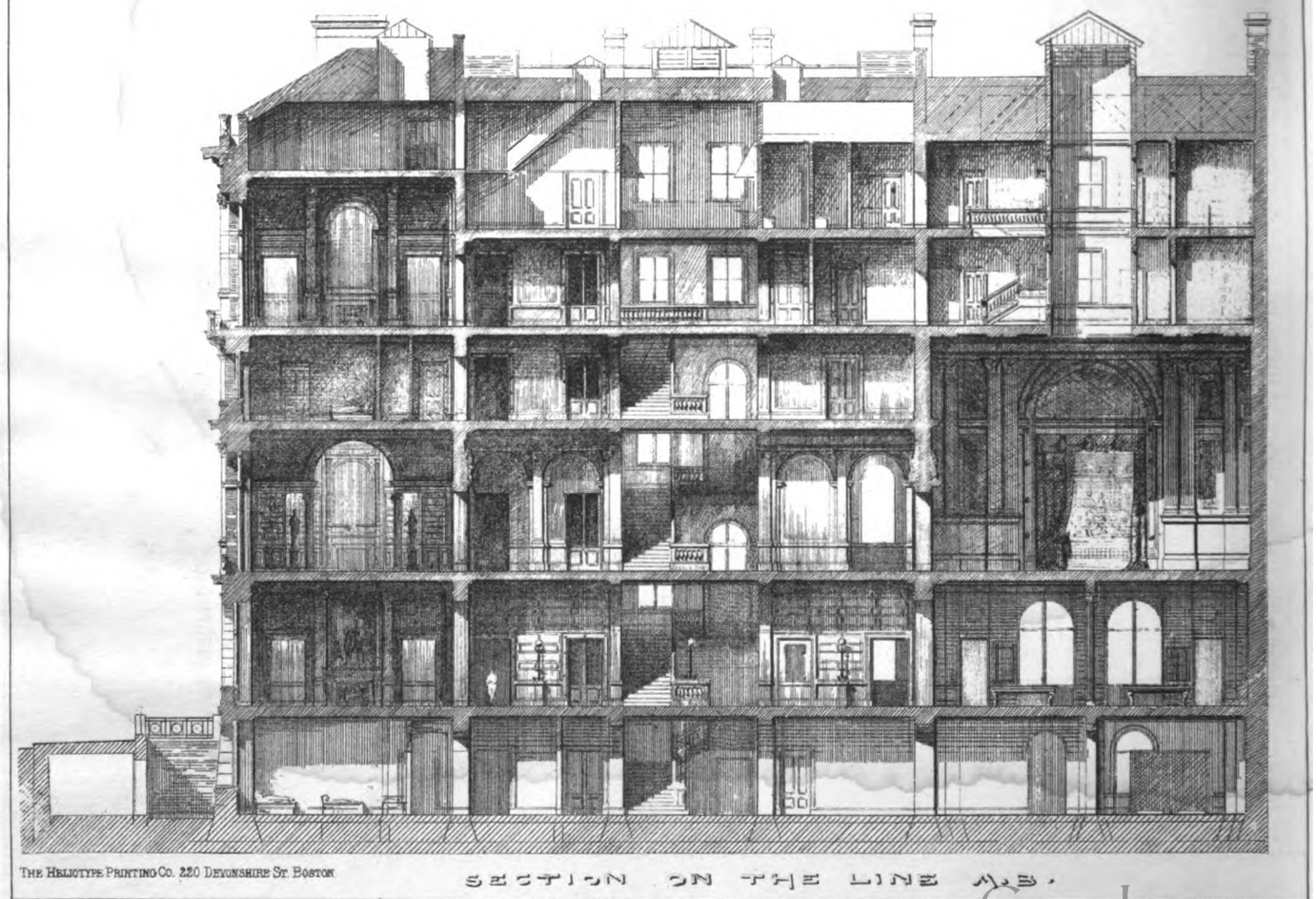


SIDE ELEVATION



THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

SECTION ON THE LINE A.B.

DESIGN FOR UNION LEAGUE CLUB-HOUSE.

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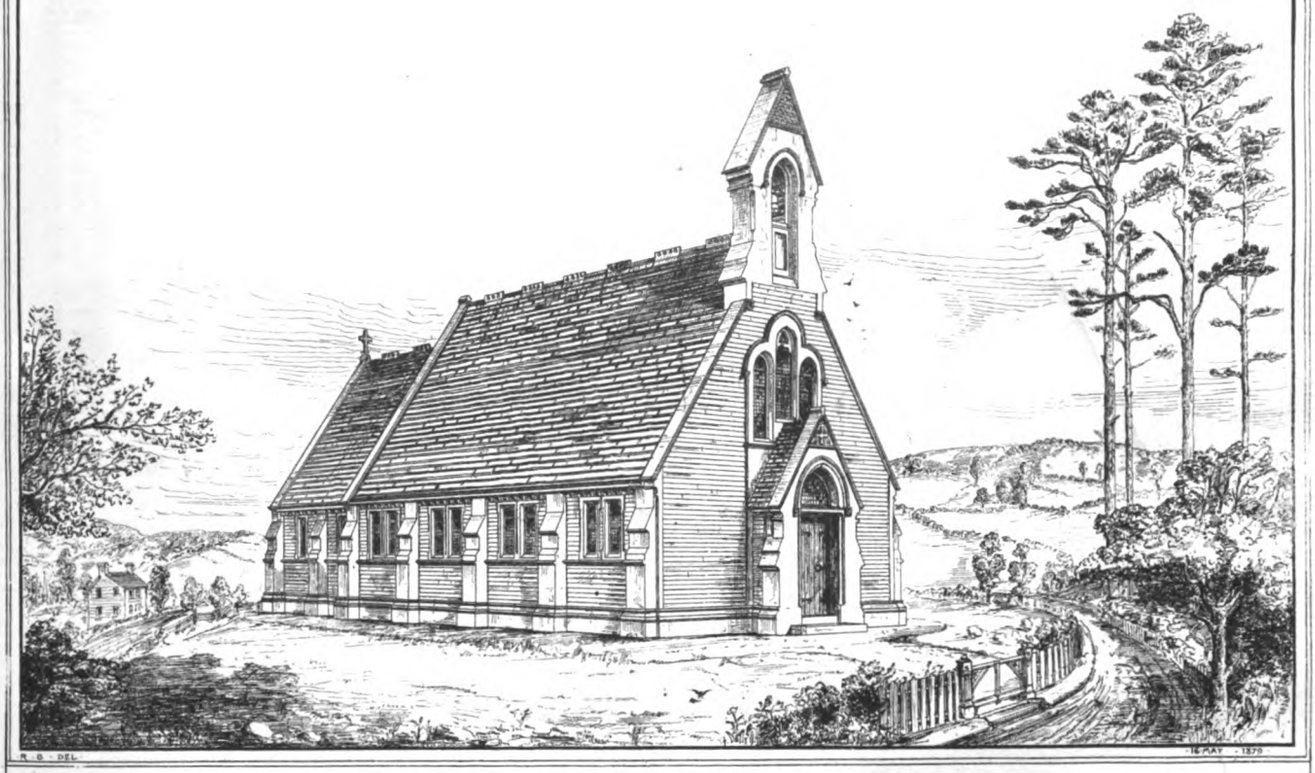
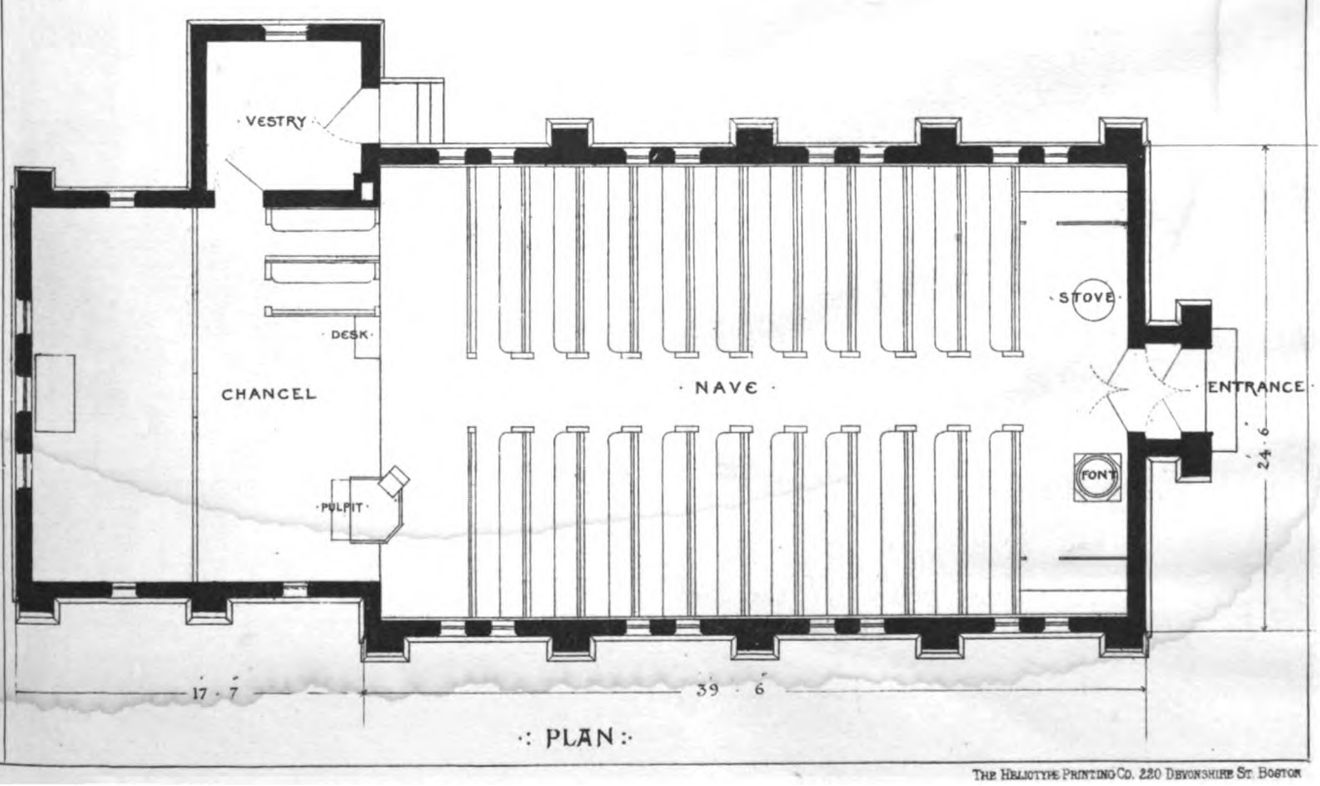
Church at Coldbrook
near
SAINT JOHN N.B.
R. Brown & J. C. Allison Archts





PLAN

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

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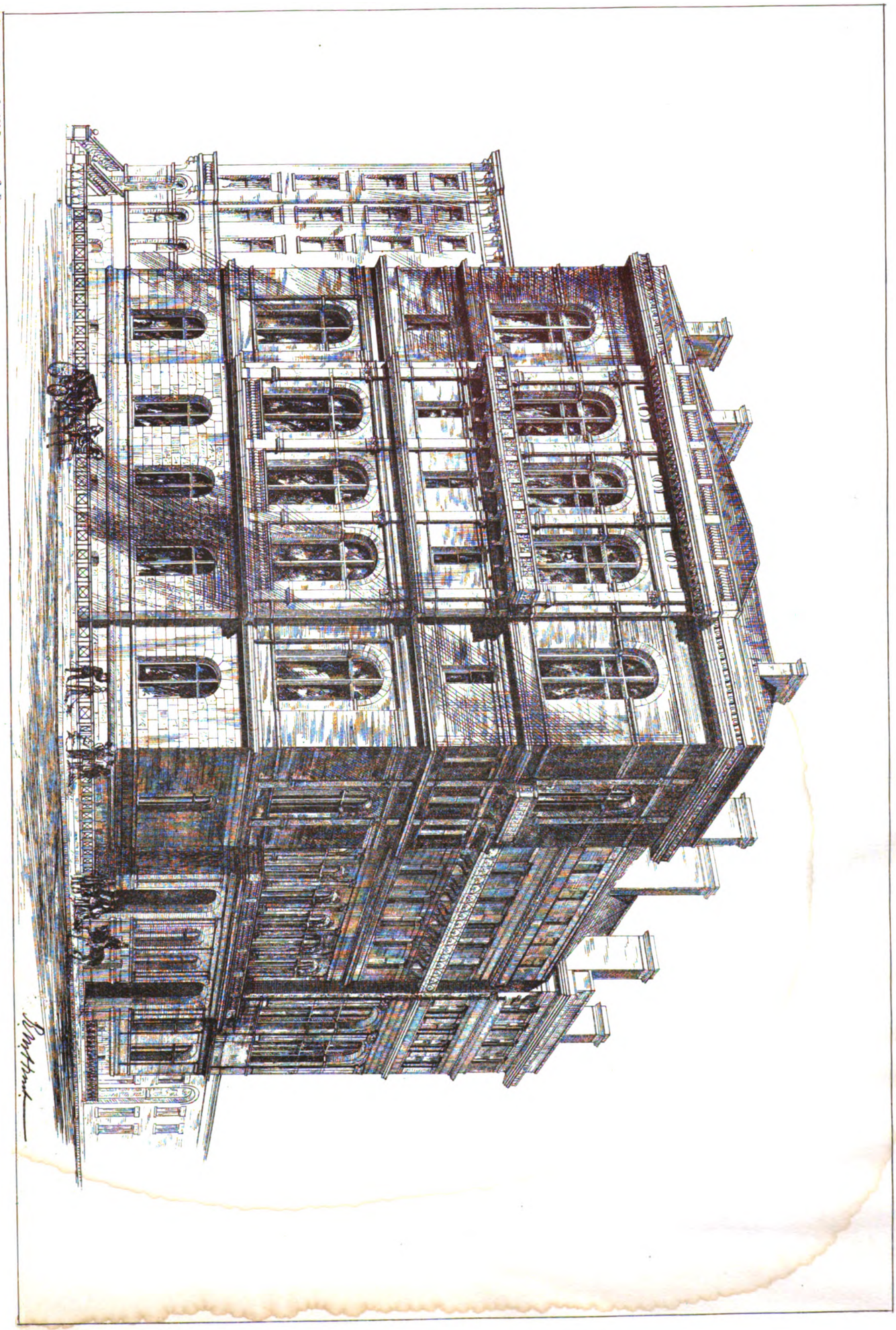
THE BOSTON TYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON



DESIGN FOR UNION LEAGUE CLUB-HOUSE.

R. M. HUNT, Architect.

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houses we may make the following extract from the report of a Committee of the New York Board of Education: "Of the school-buildings under the charge of this Board there are not ten which are thoroughly healthy; in several, during the winter, the cold has been so intense at times as to render the dismissal of the classes a matter of necessity. The obstacles presented by school-buildings to ventilation, the great quantity of fresh air required, and the difficulty of obtaining it, without unpleasant draughts, have been so serious and so formidable, that in comparatively few of the school-buildings has any attempt been made to secure a good ventilation. The results of this general lack of ventilation are seen in the listlessness on the part of both teachers and scholars, and the dull following of routine, which are standing subjects of complaint, but which are only the inevitable consequences of breathing an atmosphere saturated with the obnoxious vapors exhaled from the lungs, bodies, and dress of the masses of children congregated in a single building. To breathe this foul air tends to produce irritability in teachers, and peevishness in scholars. If long continued, the rottenness of the air is communicated to the lungs and lung diseases are generated. The enormous mortality from diseases of the lungs is in great part attributable to the foul air breathed every day by the children in our schools."

So we find the evil of bad ventilation generally admitted and at the same time the failure of the common draught ventilation.

For theoretical as well as practical reasons draught ventilation must be more or less a failure in crowded rooms. On cold days it is very difficult, almost impossible, to introduce into a crowded room a large volume of fresh air without causing an unpleasant cold draught, and on warm days the motive power, that is, the difference of specific weight between the inside and outside air, is wanting to cause a change of the air (except the wind is blowing and the windows are opened). When we compare the different plans of draught ventilation we find that the simple and cheap ones are ineffective, that the volume of air which they bring into the room is too small to keep the amount of carbonic acid below ten volumes in ten thousand, which should be the maximum allowed, and that the best ones are complicated and expensive, and, therefore, in most cases impracticable.

There are some kinds of ventilating stoves and fire-grates, which bring in the air directly from the outside and warm it before discharging it into the room; for example, Breymann's or Ruttan's stoves, or Captain Galt's grate, which has been adopted in the barracks of the English army. These work well on a cold winter day, when a brisk fire is kept up in them, but they are, of course, perfectly useless in summer, and of little use in spring and fall. In these seasons even the best known plans of draught ventilation, those with large and complicated ventilating shafts and air-ducts, cannot effect a sufficient change of air in a crowded room, unless a special fire is kept burning in the ventilating shaft to cause the necessary draught, — that is, the necessary power to move a certain volume of air in a certain time, — which requires a difference of temperature between the air inside and outside the shaft of at least 40° Fahrenheit.

About this special fire, this "little fire in warm seasons," as it is mostly called in descriptions of systems of draught ventilation, erroneous ideas are prevalent. A little fire will cause, no doubt, some draught in the ventilating shaft, but when we come to calculate the units of heat necessary to move the required volume of air, we find that a pretty big fire is required, for not only a part of the air to be evacuated must be heated, but the temperature of the whole volume passing through the ventilating shaft must be raised 40° F. To raise, as in our example of a school for six hundred children, ten thousand cubic feet of air per minute 40° requires forty pounds of coal per hour. This quantity of coal burnt in a steam-engine is equivalent to five or six horse-power, while only two horse-power would be required to move the same volume of air by a fan in plenum ventilation. So, concerning the consumption of coal, it would be cheaper to ventilate a building by a fan, than by a special fire in a ventilating shaft.

So we find that, if we wish to have an effective ventilation under all circumstances and at all seasons of the year, *no other plan is left but forced or plenum ventilation.*

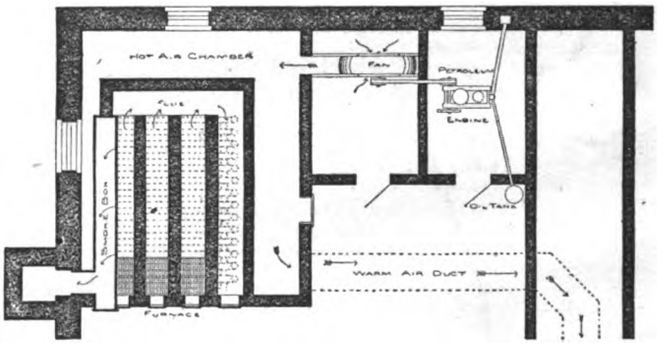
In large buildings, for example in large hospitals or asylums, where they have steam-power and the expenses are of minor importance, this plan has no difficulties; but in school-houses the case is different. Here we want not only a steady power to propel the fan, but it must be at the same time safe and cheap. The apparatus for warming the air in winter should be sufficient for a large volume of air without being very expensive. A common janitor or fireman, with a little scientific assistance from the principal teacher of the school, should be able to run the whole machine. Any plan which cannot fulfil these conditions has little prospect of becoming generally introduced in school-houses.

By the following plan these difficulties, I think, can be overcome and the above requirements fulfilled: —

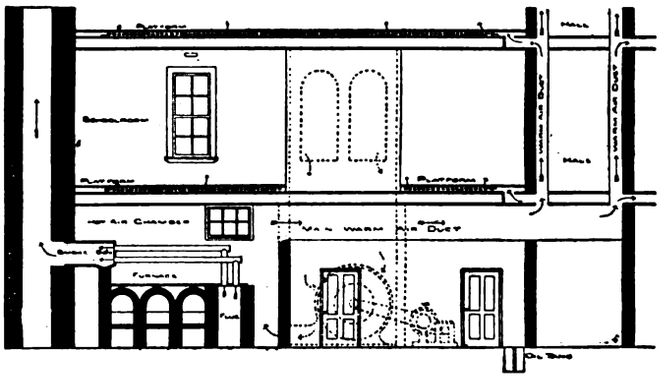
The air is forced into the rooms by a fan, placed in the cellar or an adjoining building, through a main air-duct underneath the floor, giving off branches to the different rooms. These branch air-ducts are in free communication with the space below the low platform, which commonly in school-rooms runs around the walls on three sides of the room. The front piece of this platform is pierced by many holes, or is formed by a grate, through which the air escapes into the room. The foul air leaves the room through a few openings in the walls near the ceiling. As a motive power to propel the fan a petroleum — or gas — or other kind of hot-air engine may be used, which requires little attention. Steam-power should be excluded, if possible. A steam-boiler is too dangerous a thing to have under a school-house; it requires, to be safe, constant watching and skilled labor. Water-power will seldom be available, and when taken from city water-works is very expensive.

So, in summer, such a hot-air or gas engine and a fan with the necessary air-ducts would be all that is required to secure a perfect ventilation. The size of the fan and engine has to be adapted, of course, to the volume of air required.

In winter the air has to be warmed. Here we encounter another great difficulty. The volume of air required to keep the amount of carbonic acid in crowded school-rooms below ten volumes in ten thousand is necessarily large; for example, for a school-house with six hundred children ten thousand cubic feet of air are required every minute. Several plans have been proposed and executed for this purpose, but all present peculiar difficulties when applied to our case of a common school-house. The best way of heating the air would be, no doubt, by steam or hot water, but as we have rejected steam-boilers we have no steam to heat the air by coils of steam-pipe. Heating such coils by hot water requires a very expensive apparatus. To warm on a cold winter day ten thousand cubic feet of air per minute by hot-water pipes, so that the temperature in the class rooms does not sink much below 68° F., would require four thousand eight hundred square feet of pipe surface. Such a coil alone would cost about four thousand dollars. The hot-air furnaces which we find in the shops, and frequently used in school-houses and other buildings, are insufficient to heat so large a volume of air, as they have not sufficient heating surface. The following plan of a furnace, I think, will obviate the difficulty: In the cellar, or an adjoining separate building, is built a closed, air-tight room, the hot-air chamber (in our



case of a school-house for six hundred children a room twenty by twenty-five feet and twelve feet high), which contains the furnace. Next to this is a smaller room which connects by a wide air-duct with an open window in the story above. Here the fan is located so that its outlet is in communication through an opening in the wall with the hot-air chamber. Next to the fan-room is the engine-room. As



soon as the fan is set in motion the air will be drawn through the window and air-duct into the fan, which forces it into the hot-air chamber. By passing here over the large heating surface of the furnace the air is warmed and escapes under a pressure of one third of an inch of water column — which pressure is kept up in the hot-air chamber by the force of the fan — through the main air-duct into the school-rooms. The furnace is constructed of brick and sheet-iron. It has two or three fireplaces, according to the size of the building, and the climate. The arched brick flues of these fireplaces empty into a common flue, from the top of which a number of ordinary stove-pipes, offering a large heating surface, carry the hot gases to a common smoke-box which connects with the chimney. The fire-doors are outside the hot-air chamber. In the morning and on very cold days all fireplaces are used; on less cold days or towards noon, when the outer temperature rises and the brickwork of the furnace is thoroughly heated, only one or two would be necessary. Such a furnace could be built very cheaply, and the materials could be found in the smallest town.

Below I give the plans and calculations for a ventilator of a school-house for six hundred children and a climate where the temperature

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may fall to 0° F. The expenses of such a ventilator would be, approximately: —

Fan	$400.00
Engine, 3 h. p.	400.00
Hot-Air Chamber and Furnace	400.00
Air-Ducts, etc.	300.00
	$1,500.00

From this sum we have to deduct the price of the stoves which are saved by this plan; so that its extra expenses could be reduced to about twelve hundred dollars; and how easily could such a sum be saved in the erection of a building which costs thirty or forty thousand dollars, by doing away with useless ornaments, or by reducing the height of the rooms two or three feet. For concerning the purity of the breathing air the height of the room is of minor importance, provided there is a sufficient ventilation, as every person in the room gets his ration of fresh air constantly from the outside and has no need to draw upon the store of fresh air in the room. With natural ventilation the air-space for each person is of the highest importance, as any insufficiency of ventilation may be somewhat compensated by an increase of air-space. With forced ventilation we have only to see that the cubic space of the room stands in such a proportion to the amount of air supplied, that the velocity of the air moving through the room remains imperceptible. The air in a room should not be changed oftener than seven times in an hour. A school-room for fifty children should not have less than seven thousand cubic feet, or not less than one hundred and forty cubic feet for each child, the hourly supply of air being forty-nine thousand cubic feet.

CALCULATIONS FOR A VENTILATOR OF A SCHOOL-HOUSE FOR SIX HUNDRED CHILDREN.

$f =$	Amount of carbonic acid in 1 vol. of fresh air	0.0004.
	Carbonic acid exhaled by 1 child per minute	16 cubic inches.
$C =$	Carbonic acid exhaled by 600 children per minute	5.55 cubic feet.
$f + \frac{C}{A} = m =$	Maximum amount of carbonic acid allowed in 1 vol. of air in the class-rooms	0.0010.
$\frac{C}{m-f} = A =$	Fresh air required per minute to prevent a greater accumulation of carbonic acid than the maximum allowed — nearly 1 cubic foot for every cubic inch of carbonic acid exhaled	9,250 cubic feet.
$B =$	Capacity of each room	10,000 cubic feet.
	Number of class-rooms	12.
$x =$	Amount of carbonic acid in 1 vol. of air of a room after an occupation of t minutes.	

$$x = f + \frac{C}{A} - \frac{\frac{C}{A}}{\frac{At}{12B}}$$

Fan and Air-Ducts.

(Sturtevant's or Morris's Fan, 5-inch disk.)	
Revolutions per minute	200.
Capacity per minute	10,000 cubic feet.
Sectional area of main air-duct	9 square feet.
Velocity of air in same, per second	18 feet.
Sectional area of branch air-ducts for each room	1 square foot.
Velocity of air in same, per second	13 feet.
Pressure in main air-duct in inches of water column	0.3 inch.
Fresh air for each room, per minute	771 cubic feet.
Fresh air for each person, per hour	925 cubic feet.

Furnace.

$T =$	Temperature of rooms	68° F.
$T' =$	External temperature	0° F.
$T'' = 2T - T' =$	Temperature of hot-air chamber	136° F.
$T'' - T' =$	Number of degrees which the air is to be warmed	136° F.
	Weight of 10,000 cubic feet of air at 0° F.	868 lbs.
	Specific heat of air	0.238.
	Capacity of heat of 10,000 cubic feet of air, (Cal)	206.
	Units of heat required to raise the temperature of 10,000 cubic feet of air 136° F. = 206 × 136 = U. H.	28,016.
	Available heat in 1 lb. of coal (80 per cent), U. H.	10,800.
	Coal required to raise the temperature of 10,000 cubic feet of air 136° F.	2.6 lbs.
	Coal required per hour for the whole school-house	156 lbs.
	Heating surface of brickwork of furnace, 300 square feet.	
	Heating surface of iron plates, 28.	
	Heating surface of 34 stove-pipes, 13 feet long, 5 inches diameter, 578.	
	Heating surface of smoke-box, 100.	
	Total heating surface of furnace	1,006 square feet.
	Grate surface	12 square feet.
	Ice required to cool the air in summer for each degree F., per hour	100 lbs.

CORRESPONDENCE.

IRON FRONTS. — NEW OFFICE BUILDINGS.

NEW YORK.

When iron fronts were the entire rage in this city, and legitimate architecture but now and then showed itself with more or less of success in special edifices, there was a general and persistent outcry against them. It was pointed out that canons of good taste, fixed laws of mechanics, and every rule of architectural decency and honesty were set at naught in these showy, box-like structures. But to the owner of property they offered the advantages of cheapness with great rapidity in construction, while giving ample floor space and light. All that was necessary to secure such an edifice was the filling out of a blank form, giving a few particulars of size, etc., and out of the stock in the foundry yard the building was picked in section, rivetted together, and almost to an hour the job was turned over as "a magnificent commercial palace," to the delighted investor. Every moulding and feature was designed as an imitation of stone, and when painted, the iron masks passed very well to the popular eye and at the proper distance as marble. Property owners thought they had reached a solution of the high per cent problem in real estate investments, and certain of our streets began to put on a sort of monotonous splendor. But a few out of the great multitude appreciated the hollowness of such an advance, and were assisted wonderfully in their exposition of true principles by conflagrations which gave warm support to their assertions that these iron shells were mere fire-grates, when put to the test. Still there were some who brought their best endeavors to the work of using iron in full acknowledgment of its particular merits. Sheet-iron churches and cast-iron columnar warehouses were both frowned down, and many buildings in the city to-day tell of the efforts of architects of merit and standing to apply iron architecturally. Mr. Hunt did something on Broadway; the late Mr. R. G. Hatfield erected iron-work; and one of the latest attempts was on the Austen Building at Houston Street and Broadway, where Mr. Russell Sturgis, Jr., used iron in such a way that nobody could doubt that it was an iron and not a stone structure. Showing the bolt-heads was not, however, creating an iron architecture, and this year shows more than ever the returning feeling against this work, and brick and stone are used in a majority of the buildings erected, with iron used in entire subordination and almost entirely constructively.

The present season has witnessed the completion of two important works in the line of "office buildings," or structures out of which it is intended to secure a large rental by the leasing of a large number of small apartments. Elevators have made possible the use of any number of floors which the architect may find it possible to put between foundation and roof, and this possibility the owner insists upon having stretched to its utmost. There must be cheapness, too, and rapidity in building, especially in cases where an old is replaced by a new structure, and very often the demand is made upon the architect to produce a design which shall be different from anything already in existence. It matters not in many cases whether the new be good, bad, or indifferent; provided it be unique in its use of material or combination of forms, the owner is content. With all these imperative general conditions, and in special cases as many more special ones equally rigorous, the architect sets to work.

Messrs. Silliman & Farnsworth have produced the Morse Building, and Mr. Hatch has given New York the Boreel Building. The former stands on the corner of Beekman and Nassau Streets, and on a site 80 x 75 feet, a structure nine stories high was demanded. Many who watched the uprising walls wondered whether they would ever cease growing sky-wards. The young men to whose hands the work was entrusted were tied down to a brick construction exclusively, and they have followed instructions most rigorously. There is contrast, diversity, and change, a great remove from monotony, and a solution of the difficult problem which must strike all as a most satisfactory one. There are matters of pure construction which are as yet unsettled: terra-cotta is used in various ways as constructive ornament, and it remains to be seen whether a satisfactory exhibit of the employment of that material is to be given us in this city. No one will claim that any terra-cotta work of consequence has yet been done here. The Morse Building will be interesting as an experiment, and as such much of its terra-cotta work must be classed.

The Boreel Building started with many more natural advantages. It has a plot 101 x 146 feet, with streets on all sides, one front and two of the angles being on Broadway, and for years no better opportunity has been offered for adding to the architectural wealth of that much over-admired avenue. There was height, enforced in the seven stories which rise above the curb line, but there was breadth enough to enable the designer to break undue altitude by introducing widening features. With all these openings it must be said that the merit of the building is within it, for the expanse of ground space gave opportunity for an excellent plan — a system of corridors about a central covered court, in which are placed stairways and elevators, enabling every room to get an abundance of light and air. The building is probably well constructed, but architecturally considered it does not bear much evidence of study. The Boreel Building was built from trust funds, and therefore a certain line of expenditure for special labor and rich and rare material, which a private individual, or a wealthy corporation, club, or congregation might properly indulge in, is cut off. But to assume that a satisfactory result cannot be reached except by the spending of these extra amounts is absurd, and none should be more ready to preach and practice this

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plain truth than an architect. The architect in this case did not hide his poverty of means by meretricious devices, to make the whole look like a palace. It catches the eye of the multitude — as the New York Post Office does — by its size alone.

If the architect is only to reflect the crudities and desires, as well as the real wants and proper demands of his client, then there is an end of advance. If architects are not to lead, let them step back into the position of contractors; let them throw aside artistic feeling, or study and cater to the unguided public opinion. There will then be cheap buildings. An honest architect of that type may then be safely trusted with the outlay of "trust-funds," and he will not be under the slightest necessity for making, as now, an apology for his work when done. He has filled his orders, met his clients' desires, carefully avoided exercising any of the powers or attainments which now permit him to claim the title of architect, and everything he puts up, provided it does not fall down, and gets the "Bravo" verdict of its untaught owner, must be considered as eminently successful architecture. W.

LIME AND BRICKS.

IN the course of the annual meeting of the Iron and Steel Institute, which was held last week at the Institution of Civil Engineers, Great George Street, Westminster, Mr. Edward Riley, F. C. S., read a paper, entitled, "A Ready Means of Moulding Lime or Basic Bricks and Linings for Furnaces, Converters, etc."

Mr. Riley said that several plans had been suggested and used for the manufacture of basic or lime bricks, for the lining of Bessemer converters and cupolas, and various attempts had been made to line the same by ramming either with lime or limestone. One difficulty and objection in using limestone either for the manufacture of bricks or for ramming is the very large loss in weight and bulk the material must sustain from the expulsion of the carbonic acid and a little water, the percentage varying from forty to forty-five per cent in weight, and the shrinkage in bulk being at least twenty-five to thirty-five per cent. The use of quicklime is impracticable, as it is too dry and pulverulent in its character, and it is impossible to mix it with water, on account of the chemical action of the water on the lime. It occurred to the author that if some cheap liquid could be used that had no chemical action on the lime, it would be possible to mould the lime either by ramming or by pressing it into moulds. Various liquids had been tried, such as crude petroleum oil, coal oil, and resin oil. All these answered very well. Experiments were first made on a small scale by mixing ordinary lime with from five to ten per cent of crude petroleum oil, and compressing it by hammering in a small steel cylinder with a piston of about 1½ inches in diameter. It was found that the cylinders of lime, after compression, might be at once placed in an ordinary fire, the petroleum burned quietly off, and left a solid cylinder of lime. If burned at a low to a bright red heat, no contraction takes place at all. If, however, the cylinders are burned at a high temperature, they contract to a small extent. Many hundreds of experiments have been made with different kinds of lime, and no difficulty has been experienced in making perfectly solid cylinders; the only precaution necessary is to see that the lime is well-burned, and that it has not been exposed too long to a damp atmosphere. Lime that has been exposed for ten days or a fortnight to a damp atmosphere would not give satisfactory results. Various mixtures of burnt clay and oxide of iron, and other substances, have been made with the lime. From five to seven and one half per cent of burned clay makes it much harder after burning. An admixture of three to five per cent of oxide of iron in the form of blue billy also consolidates the lime; at the same time the shrinkage is increased. The above proportions were used with a nearly pure lime. My experiments on a small scale being so satisfactory, I at once commenced to make ordinary bricks, using a Bodmer's hand hydraulic brick-press, which answered admirably. On submitting the lime to a pressure of about one ton per square inch, most perfect bricks were made, and from twelve to fourteen could be readily moulded and forced out of the mould in an hour in the hand press; the bricks could be easily handled, and would bear shaking if taken hold of at one end. These bricks were made at Notting Hill, and had to be carried on a man's back and by rail to my laboratory in Finsbury Square. Although I have made some dozens of the bricks, in no case was one broken; the only injury — and this is of no practical importance — was that the sharp, square edges on a few were sometimes slightly broken; the only means that I had to burn the bricks was by using a small square assay furnace, one foot square and two feet six inches deep. After lighting the furnace, it was filled to a depth of eight inches to ten inches with coke, broken small; the bricks were then placed on this material and burned at a moderate temperature for about twelve hours. The first three bricks were quite perfect, excepting that one was broken in two with a sharp fracture, probably due to the falling of the brick with the coke. The lime used was made from Huddlestone stone, which is a fine-grained building stone used in London, the same with which York Minster is built. It is nearly chemically pure magnesian limestone. In burning the bricks, so far as my experience has gone, it is better to use a moderately quick fire instead of a slow, gradual fire. A small experimental converter, about twenty inches wide and twenty inches deep, exclusive of top part, was rammed up with the ordinary magnesian lime used in Sheffield. The lime was ground in a mortar-mill with from ten to fifteen per cent of crude petroleum oil. The vessel was first fired with a slow fire, which had the effect of making the upper overhanging part of the converter crumbly, and ultimately caused it to fall. After repairing this damage the fire was relighted, a gentle blast was put on, and rapidly increased to a full blast. A little roll scale was thrown into the converter, and it was found that a good hard glazed surface was formed after blowing some hours with coke. From one hundred-weight to two hundred-weight of Ferry Hill pig-iron was run into this converter, first adding some iron scale and lime. After blowing a minute or two, a few pounds of a mixture of iron scale and lime were added. It was found, however, that this chilled the metal, and after blowing for rather less than ten minutes, it was thought desirable to run it out. A second charge was then run in and blown about ten minutes, but, from the small size of the converter, and the fear of the metal setting, it was found necessary to run it out again before complete blowing.

The metal from the first blow was so much mixed with cinder and sand that it was difficult to get a fair sample. In the small converter the head was movable, and the lower portion was first burnt with coke. It was found that the lining expanded and rose up above the edge of the plates. Some of the metal remained in the converter on account of its being chilled. The lining was very solid and hard, and could only be detached from the converter by driving in a chisel with a hammer.

The experiments made up to the present time have been carried out under considerable disadvantages. I have only within the past week had the advantage of a kiln, and am still without a properly constructed brick-press at Sheffield, so that the bricks may be burned where made. I have succeeded in making and burning several ordinary Bessemer tuyeres for an eight-ton converter, as nearly as possible perfect, by simply ramming the lime in the moulds. The kiln I am using requires alteration so as to obtain a higher temperature, and the only means I have at present for making the bricks is under the steam-hammer. The blow, however slight, makes the upper part of the brick scaly, and not solid as when pressed by hydraulic pressure. I have also found this to be the case in my small experimental cylinders. I have made a few experiments in moulding lime into forms adapted to metallurgical purposes, such as scarifiers, crucibles, etc., and anticipate that my plan for these purposes will be especially advantageous. As yet, however, I have only made scarifiers. I find that bricks and cylinders made from ordinary Sheffield lime may, when burned at a high temperature, be steeped in water without slaking.

The following is the composition of the bricks after burning: —

Silica	8.85
Lime	51.80
Magnesia	35.35
Alumina	2.60
Peroxide of iron	1.40
Sulphide of calcium	.55
	100.55

I regret that in consequence of the short experience I have had in the manufacture of bricks and tuyeres, and other moulded forms of lime, I am unable to present to the Institute so perfect and practical a description of my process as I could wish. It was only at the commencement of this year that I made my first bricks, and my process requires further time to perfect and develop it.

I hope by the assistance of one of Mr. Bodmer's excellent hydraulic brick-presses to turn out from six to twelve bricks a minute, mathematically true. These, I believe, can at once be used to line up a converter or other furnace. The bricks, being perfectly true and square, can be built in almost without mortar or material for the joints; and I see no reason why ordinary converters should not be lined in twenty-four hours, and burnt and glazed in another twenty-four to forty-eight hours. Either the lining of the converter with bricks or by ramming seems to me the most ready and economical means of obtaining a lime or basic lining.

An objection might be raised to the use of large quantities of crude petroleum, viz., that it would materially increase the price.

There are, however, so many sources of cheap crude oils, — as tar and resin oil, etc., — that any quantity could be produced, and if such oils are required in large quantity, it would pay to distil much of the bituminous shale that is now thrown away for the crude oil, extracting, at the same time, the solid parafine. — *The Builder.*

THE OWNERSHIP OF DRAWINGS. — A LEGAL CASE.

WASHINGTON, D. C., June 24, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

As has already been noticed in some of the public prints, a case has been pending in the Police Court of this city, the final decision of which will prove of interest. That all of the profession may understand the circumstances, I quote the following from the Baltimore *Sun* of the 21st inst.: —

WASHINGTON, June 20. — A case is pending in the Police Court here, the decision of which will prove of interest to all architects and builders. A Mr. George R. Tolman succeeded the late Thomas M. Plowman as an architect, and was obliged, by right of his succession, to fill an unexpired

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agreement for the completion of certain houses in process of erection and owned by District Commissioner Phelps. It seems an agreement was entered into between the architect and Mr. Phelps by which the latter guaranteed to pay a sufficient sum of money on account to meet the current expenses of the office until the affairs of Mr. Plowman could be settled. A misunderstanding having arisen relative to this agreement, Mr. Phelps desired to sever connection with his architect, and proceeding to Mr. Tolman's office demanded all plans and drawings belonging to the houses. This demand was refused. A writ of replevin was sworn out, but in the mean time Mr. Tolman, in the exercise of what he thought to be his right, put the plans away for safe keeping, and was arrested soon afterwards on the charge of embezzlement, Mr. Phelps claiming that by the terms of the agreement Mr. Tolman was simply employed as a draughtsman, and not in the capacity of an architect. It having been established that Mr. Tolman was an architect, and as such was executing an existing agreement left to him by his predecessor, the question at issue now is, "To whom do the plans of an architect belong?" Supervising Architect Hill and many of the prominent architects of this city have been called as experts, and their testimony is that it is the invariable practice for an architect to retain all plans; that these plans are simply used to convey an architect's idea to his employer, and are merely instruments of service in the execution of professional work.

The counsel are now looking up decisions upon this point, and a further hearing of the case will be had next Saturday, when it is expected that a decision will be made. Architects throughout the country appear to be taking much interest in the case. Commissioner Phelps entered a civil suit previous to the criminal suit.

On Saturday last, when the case was called, the judge stated that while he would not pass upon the question of the ownership of the plans, it was clear that he could not hold Mr. Tolman any longer, as no criminal intent had been proven, and he would therefore order the defendant's discharge.

The case now goes to another court, upon the civil suit mentioned above, which is returnable July 1st, proximo. It is unfortunate that so few cases of this character have found their way into courts of record, as the counsel, though making arguments based upon the justice and common sense view of the case, find very few decisions directly sustaining them.

Mr. Tolman has secured the services of three well-known attorneys, and when the case is called in all probability abundant cause will be shown "why said plans should *not* be delivered to the owner of the houses."

As to the final decision of the case, it may be said that it is hardly probable that any court in the United States will hold that the plans of an architect belong to his client. If it were so we might expect that on the principles established by such a decision any person having occasion to avail himself of the services of a lawyer could at will demand all the briefs used in his case; or a fashionable lady could control all patterns used in making up her wardrobe. X.

NOTES AND CLIPPINGS.

Professional Charges of the A. I. A. — *For full professional services (including superintendence), 5 per cent upon the cost of the work.*

Partial service as follows: —

For preliminary studies, 1 per cent.

For preliminary studies, general drawings, and specifications, 2½ per cent.

For preliminary studies, general drawings, details, and specifications, 3½ per cent.

For stores, 3 per cent upon the cost, divided in the above ratio.

For works that cost less than $5,000, or for monumental and decorative work, and designs for furniture, a special rate in excess of the above.

For alterations and additions, an additional charge to be made for surveys and measurements.

An additional charge to be made for alterations or additions in contracts or plans, which will be valued in proportion to the additional time and services employed.

Necessary travelling expenses to be paid by the client.

Time spent by the architect in visiting for professional consultation, and in the accompanying travel, whether by day or night, will be charged for, whether or not any commission, either for office work or superintending work, is given.

The architect's payments are successively due as his work is completed, in the order of the above classifications.

Until an actual estimate is received, the charges are based upon the proposed cost of the works, and the payments are received as instalments of the entire fee, which is based upon the actual cost.

The architect bases his professional charge upon the entire cost to the owner of the building when completed, including all the fixtures necessary to render it fit for occupation, and is entitled to a fair additional compensation for furniture or other articles designed or purchased by the architect.

If any material or work used in the construction of the building be already upon the ground, or come into possession of the owner without expense to him, the value of said material or work is to be added to the sum actually expended upon the building before the architect's commission is computed.

Drawings, as instruments of service, are the property of the architect.

By order,

Richard Upjohn, *President.*

A. J. Bloor, *Secretary.*

Moore's Statue. — The people of Dublin are disgusted to find that the statue of Tom Moore, recently dedicated there, is of zinc instead of bronze, and when it was newly painted several cracks were found in the head, through which the rain had beaten, filling the statue about half full of water.

Statuette of President Woolsey. — Professor John F. Weir of the Yale School of Fine Arts is modelling in plaster a statuette of ex-President Woolsey of Yale College. The venerable instructor and jurist is seated in a curious old chair.

The Church of St. Roch. — The tower of the historic Church of St. Roch in Paris has been pulled down to make room for a new street. Architecturally it was not beautiful, nor was it very ancient; but as part of the Church of St. Roch it has associations which should have preserved it from destruction by sacrilegious street-openers. This church, which is a noticeable object in the Rue St. Honoré, near the Tuileries, was taken possession of on October 5, 1795, by the French populace under Lepelletier, as a stronghold in their insurrection against the Convention — an insurrection which was put down by young Napoleon Bonaparte, then an unemployed artillery officer, complaining of his poverty and disposed to offer his services to the Sultan of Turkey.

Polish National Museum. — The Polish National Museum at Rapperschwyl, near Zurich, is becoming with every year of greater historical interest. The museum was founded ten years ago by Count Ladislas Plater, in the antique château at Rapperschwyl, and since then has been constantly receiving gifts referring to the history of Poland. Very recently a Polish lady, living in Florence, made a magnificent addition to the museum — namely, an invaluable numismatic collection, consisting of some thousand odd numbers of Polish medallions and coins and 271 cameos, representing the chief events of Polish history and the portraits of Polish notables, all executed by talented artists. The collection is a unique one, and is valued at 40,000 francs The value of the entire collections of the museum is stated to be 1,000,000 francs. The library contains 30,000 volumes. The collection of medallions, coins, copper-plate engravings, manuscripts, and autographic and ethnographic curiosities, represents thousands of numbers. There are 17,000 documents and diplomatic letters, dating during the last three centuries, all referring to Polish history. The reading-room of the museum receives about fifty journals from various lands. The development of this interesting museum shows that the national spirit of Poland still lives.

How the Indians Made their Arrow-Heads. — A young man in the Smithsonian Institution, writes the Washington correspondent of the Cleveland *Leader*, has just made public the discovery of the method employed in making the stone and volcanic-glass arrow-heads, daggers, knives, axes, and razors of the prehistoric races. Up to this time this has been a great problem to all antiquarian students, but no theory has ever been advanced showing so practical results as Mr. Cushing's. He started to solve the difficulty by putting himself in the identical position of the Aztecs or Mound-Builders — without anything to work with except sticks, various shaped stones such as he could find on the banks of any stream, and his hands. After making some rude implements by chipping one flint with another, he discovered that no amount of chipping would produce surfaces like the best of those which he was trying to imitate. He therefore came to the conclusion that there was another way of doing it, and, by chance, tried pressure with the point of a stick, instead of chipping by blows of a stone; when, presto! he found that he could break stone, flint, and obsidian in any shape he chose. Soon he had made spear-heads and daggers that would cut like a razor, as good as any he had before him, which had been picked up from all over the world. By a little more observation, he found that the "flaking," which he calls his process, on the old arrow-head left grooves that all turned one way. He produced a like result by turning his stick the easiest way from right to left. He therefore concludes that prehistoric men were right-handed people like ourselves. This conclusion is reinforced by the fact that occasionally an arrow-head is found that has flakes running from left to right, showing a left-handed person. The importance of the discovery is that it shows that the early races were able to do this work without the use of iron or bronze, a thing long doubted.

The African Sea. — Messrs. Dufyur, Jegon, and Baronnet, the three French engineers who have for six months been taking soundings with Commandant Roudaire to test the possibility of converting the Shotts of Tunis into an arm of the sea, have just returned to Marseilles. Their report is favorable, although they themselves have suffered from the aridity of the district, where no rain has fallen for twenty-three years.

A Chinese Tile Factory. — A correspondent of the *Builder*, in a recent account of his visit to one of the mining districts of China, thus describes the Imperial tile manufactory at Lien li ku, about fifteen miles west of Pekin: In this factory all the yellow tiles and bricks required for imperial buildings are made, as also large numbers of green, blue, and other colored tiles for various ornamental purposes. The material used is a hard blue shale, nearly as hard as slate. This is allowed to lie in heaps for some time. It is then ground to powder by granite rollers, on a stone floor thirty to forty feet in diameter. The powder is then stored in heaps and taken to the works as required. For ordinary work the powder is mixed with a proper proportion of water and moulded into large bricks, which are laid out to dry for some hours, after which they are dealt with by the modellers. When bricks are to have a moulding on them, say for coping a wall, the plan of operation is as follows: Two pieces of wood, each cut to the shape of the moulding, are placed upright on a slab. The clay brick is placed between them, and two men run the mouldings roughly along with chisels. They then apply straight edges to test the accuracy of their work, and finally rub the edges with moulds somewhat in the same way as plasterers make mouldings at home. The brick is then passed to a third man, who cuts any necessary holes in it, and to a fourth, who trims it off and repairs any defect. The more ornamental tiles and bricks, representing fabulous animals, etc., are first roughly moulded, and afterwards finished off with tools exactly similar to those used for modelling in clay in Europe. Some of this work has some pretension to artistic merit. All the bricks and tiles are baked in ovens, and then, after having the glaze put on, are baked a second time. All the work done at this manufactory appears to be first-rate, and the number of people employed when they are busy is about five hundred.

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THERE is a serious loss to the country in the discontinuance of the U. S. Board for Testing Iron and Steel, which, after having equipped itself with laborious care for a very important work, has had to turn over its apparatus to the War Department, and dissolve, because Congress refused to provide for it any longer. This Testing Board was appointed by Congress and an appropriation made for it four or five years ago, on the earnest intercession of the American Society of Civil Engineers. It set about its work with great thoroughness, made some investigations and some valuable reports, but soon found that no machine was at command which was adequate for its experiments. It was a matter of difficulty to decide upon the plan of such a machine as the Board needed, and of much time and cost to construct it. The system and thoroughness of the Board outlasted the interest of a Congress which is impatient for results and sceptical of scientific deliberation. The second appropriation was made with the condition that when it was expended the Board should cease to exist, and that its equipment should revert to the Secretary of War. The Board lived long enough to complete its machine, which is now at the government arsenal at Watertown, Mass., — a machine which is a great advance on all previous testing machines, and whose delicacy, precision, and power are the wonder of all the engineers who have seen it. And now that its chief expenditure has been made, and it is ready to do its most valuable work, it has expired with the last fiscal year, ending on the 30th of June. The Engineers' Committee on Tests, at their late convention in Cleveland, reported with a justifiable melancholy this untimely end of an auspicious undertaking, and urged a renewed appeal to Congress, which we hope will be seconded by whoever has at heart the advance of sound knowledge of construction.

THAT Congress should have thus allowed the Board to die of inanition is perhaps more to be regretted than to be wondered at. To persons who, like Congressmen, did not understand the difficulties and labor of the work, or the need of the costly preparations that had to be made, it might naturally seem that the ninety thousand dollars that had been appropriated ought to be enough for any amount of testing that the Board undertook to do; and that when it had only got its machinery in order it had made very little progress. The average Congressman, for that matter, is likely to look upon the business of testing iron as one which is the concern only of a few engineers and iron workers, and it would probably be difficult to persuade him, as it would the average constituent, that it was a matter that concerned the whole people sufficiently to warrant spending much of the public money on it. Nevertheless it is, as our readers will recognize, of great importance for the right study of constructions upon which an enormous amount of money and innumerable lives are risked every day, to say nothing of its general scientific interest, and it is the more urgent for us in view of the growing tendency to press the use of iron into all kinds of construction, to intrust its use to unscientific hands, and to cut it down in using to the utmost possible tenuity.

PERHAPS after all the greatest benefit of a recognized official test to a people which needs more than anything a standard, though a benefit which would naturally elude an estimate, would be to enforce upon the popular mind a sense of the importance of precision and care in the use of material. It might do more than building laws or inspection to prevent accident and loss of life if men could learn that construction, and especially iron construction, was not to be fixed by rule of thumb, a matter in which within wide limits one thing would do as well as another, but one in which by knowledge a very definite limit could be fixed, that must on no account be passed. Even if there were a common recklessness in choosing the limit, it would be a gain to acknowledge one. The great difficulty is not so much that ordinary constructors are audacious in going near the verge of danger as that they do not know where danger is, nor that they can set any practicable bound beyond which they may know that it will lie. The common constructor does not know that there are such things as carefully calculated dimensions and a rigidly scientific use of material. If he did, we should be relieved from one of two chief causes of danger, and should have to dread, not his innocence, but only his recklessness. The example of the Government might do much to impress on his mind a sense that there could be accuracy in his work; and the interests at stake are so great and universal that an influence whose effect could hardly be traced in individual cases might be of great importance in the gross. We can hardly expect Congressmen to be alive to considerations so broad as this, so theoretical perhaps, any more than we can expect them to be statesmen; but if every one who had the knowledge would do his best to infuse into the community a sense of the importance of studying accurately the quality of our materials, we might expect it to percolate through to legislators.

THE most picturesquely striking project, for its historical associations, that we have heard of, one which is peculiarly appropriate to an age that mingles archæology and commerce, is the rehabilitation of Carthage, or rather of its port. It is a very natural corollary to the plan for restoring the inland sea that once occupied a great part of the modern (save the word!) Sahara, which is now occupying the attention of both English and French projectors, though as usual in different ways, and for which Captain Roudaire is making test-borings in the sandy shore of the Gulf of Cabes. (*American Architect*, May 20, 1876, and December 28, 1878.) If such a sea is to connect the inhabited territory of Tunis with the fertile regions of Soudan, and inland navigation is to be brought to the very gates of Timbuctoo, it is reasonable to look out for a good harbor near the mouth of the Shotts by which the communication is to be opened, and natural that the commercially enterprising Tunisians, whose Bey has taken great interest in the explorations of Captain Roudaire, should see an opportunity of increasing the importance of their city. Carthage, to be sure, whose site is only three miles from the city of Tunis, is as far from the point in the Gulf of Cabes, the Syrtis Minor of the Romans, at which it is proposed to connect the sea with the Shotts, as Boston is from New York; and the eastern spur of the Atlas Range which runs out into Cape Bon will be a barrier by land between it and the border of the new lake; but a secure and permanent harbor would be worth going some way to find on that shifting coast, and if we may trust the accounts of explorers, particularly of M. Beulé, who examined the remains of the port of Carthage, twenty years ago, there seems to be a possibility that the people of Tunis may recover in it a better port than they now possess, at less cost than that of constructing a new one.

M. BEULÉ found the two ports, connected by a neck or canal 24 metres wide and 60 long, to be 325 metres wide, and together 800 in length, giving a combined area not much smaller than that of the port of Marseilles, which will hold eleven hundred vessels. The accounts of the old historians were, according to the explorer, singularly corroborated. The perimeter of the quay of the inner (circular) port was 1,017 metres, of the island 358, making 1,375 metres of quays, and apparently dividing walls had been built out from them, all round, at every six metres, which would allow the number of docks, 220, which is traditionally ascribed to the port. The island in the centre was joined to the land by a causeway, in which was an opening as if for a draw-bridge, wide enough to allow passage for galleys of about five and a half metres beam, which accords with the width of the slips. By way of further confirmation it was found that

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the Romans, in reëstablishing the harbor, had protected the outer port from the wash of the sand by a sea-wall, and had entered it by a canal of very peculiar cross-section, the walls being concave in profile, as if to follow the shape of a vessel's side, and actually narrowing in at the top. The extreme breadth of this canal is six and a half metres, so that it could only allow the passage, one at a time, of vessels of six metres beam or less, a breadth which again accords with that of the slips mentioned above. No fragments were found to indicate the character of the architecture by which the inner port was surrounded, except two drums of engaged columns which stood at the ends of the dividing walls of the warehouses, or possibly sheds, at the heads of the slips, apparently in the position of antæ in a Greek temple *in antis*. These were fluted, with fillets, and covered with fine stucco. They were forty-seven centimetres in diameter, suggesting an order perhaps eighteen feet high. At various points under the foundation the native ledge was found, indicating that the *Cothon* had been excavated from the rock itself.

The port of Carthage, as became her commercial importance, was one of the most perfect of those of antiquity, and was celebrated by the ancient historians. M. Beulé's excavations, though carried on under difficulties, were sufficient to disclose to his satisfaction the whole plan of the port, and to confirm the historic accounts, which tell of an outer harbor for merchant ships, and an inner one for the use of the navy. This inner harbor, called the *Cothon*, was entirely artificial, a round excavation entirely screened from the outer harbor by surrounding walls, and containing separate docks or slips for two hundred and twenty galleys. At the head of each slip was a warehouse, its front decorated with two Ionic columns, which apparently formed part of a continuous portico encircling the whole port. In the centre was a round island where the admiral had his station, with a high tower or other building, whence he could overlook the walls and the outer port. M. Beulé's account of his excavations, given in the second volume of his *Fouilles et Découvertes*, is interesting. The outer port was half choked with sand, upon which were houses and trees; and the inner port, though its shape and that of the central island were discernible, was occupied with villas and gardens. By permission of the authorities more than three hundred trenches were successively opened, and the foundations of what M. Beulé considered to be the original works were traced through their whole extent. Finding that as soon as he reached the tide level the sea water percolated through the sandy soil and filled his trenches with a fluent mud from which it was impossible to free them, he contented himself, since the original foundations were pretty nearly entire to the surface of the water, with digging deep enough to free their tops, his men tracing the outline by feeling with hands and feet, and leaving the muddy water in one trench to settle while the next was dug. When the water had grown clear the outlines of the masonry were destinctly seen through it. They were measured and a plan taken of them, and the trench was filled up. The excavations showed that in the destruction of Carthage by the Romans the works of the harbor had been levelled to the water's edge, and that when, under Augustus, the city was rebuilt, the rebuilding was done here on the old foundations. The characteristic Roman superstructure, of small stones thickly bedded in mortar, was clearly distinguishable from the older foundations in regularly coursed masonry of large blocks, and the junction was at or just below the water-line.

We read in the *Journal of the Society of Arts* the proposal of a member, Mr. Cresswell, for a system of sanitary rating of houses. He would have the Society appoint inspectors who should examine houses and certify to their healthfulness, rating them according to a system of classification to be fixed by the Society, in conference with architects, sanitary engineers, and builders, and analagous to the classification of ships established at Lloyd's, the expenses of the inspection being covered by the fees for examination and registration. Such a rating, he thinks, would commend itself to householders, "and command the acquiescence of speculative builders." This is quite in the vein of the proposal for a rating of warehouses and like buildings in reference to the strength of their construction proposed by a correspondent to our paper not long ago (*American Architect*, October 12, 1878). It would be very likely to do good if it could be carried out; and in the present condition of common anxiety about drainage would be more or less encouraged, doubtless, by people who wanted houses, and by those who had houses to let of whose plumbing and drainage they felt sure. We very much doubt, however, whether, in our country, such a thing would command the speculative builder's acquiescence, in the sense of inducing him to have anything to do with it; or whether the owner of an average house would incline to avail himself of the opportunity of registering it, until the average quality of plumbing and draining had risen higher than it is now. So that such a system might be of use to those who wanted the safest house they could, but would for the present be, among us at least, little help to the ordinary family in search of an ordinary house. It would, however, if efficiently maintained, fix, and keep be e people, a standard which would have an influence in favor of a general improvement, and this would be a general benefit.

The investigations and examinations which the long-suffering City Hall at Chicago is undergoing do not seem to indicate that it is near the end of its troubles. The Bedford stone which the city persisted in using for its building, or half-building, against the protest that it would make an awkward contrast to the other stone used in the county's half, does not seem to be a success. The aldermen, awakened by the stone-cutters' attack upon the building and the complaints against the stone, have visited the quarry in committee, and have found that there is great difficulty in getting stone enough from it that is suitable for the work. The stone, it appears, not only differs in color from the stone of the county building, but gives a further sub-division of hue, being itself of two tints, a blue and a yellow; and both deteriorate as the work gets further into the quarry, so that not more than two per cent of the stone got out can be used. This makes the cost of it almost prohibitory, and the contractors are said to be anxious to substitute still another stone, that of the so-called Dark Hollow quarry. The newly-appointed superintending architect, meanwhile, finds apparently that the contractors for the brickwork are even more put about than the stone contractors; for, being short of men in consequence of their late struggle with the bricklayers, they have not kept up their brick backing with the stone-work already set, so that the upper part of the stone facing stands unsupported by any backing, a condition which will possibly make it simpler for the stone contractors to take down a part of the work which he has felt obliged to condemn. The committee of experts ordered by the city council has been appointed by the mayor, General McDowell being made chairman of it, but had not at last accounts got to work.

THE HYPÆTHRAL QUESTION.[1] IV.

If the Greek temples had been lighted by daylight, and consequently from above, the openings in the roof, by whatever manner they were effected, would have been most marked features. Yet there is not a fragment of any stone belonging to such an arrangement to be found, carefully as the sites of the buildings have been searched for indications of it. It is furthermore to be observed, that the numberless representations of temples on antique paintings and reliefs, or architectural coins, etc., show, one and all, the roof surface as complete, its ridge line as unbroken. Not once is there the semblance of any hypæthral opening whatever. Now if hypæthral temples had indeed existed, if the Parthenon, the temples of Olympia, Delphi, and Pæstum, were thus built, why did it never occur to the painter, the sculptor, or the die-cutter, to characterize these buildings by representing so peculiar a feature as a notch or as long furrows in the roof would necessarily have been? There are also numbers of ancient models fashioned like temples, often votive offerings representing some especial building. None of these show any indications of an hypæthron, characteristic as such an opening or the lids which covered it would have been. It is hardly probable that artists of the various periods and quarters of Greece combined to mystify the archæologists of another civilization by omitting to represent the opening in their temple roofs. Some stone sarcophagi shaped like temples have a socle upon their covers into which a slot is cut, which was once supposed to represent a chimney-like hypæthral opening; but it has long been made evident that these sinkings were made to receive the tenon-like foot of a portrait bust or figure, which, after the manner of the Etruscans, surmounted the ashes deposited within, — the remains of those whose earthly form the bust or figure represented.

To leave these arguments, it must not be forgotten that the most perfect monument of the Doric style, a temple which is always held to have been a representative of the hypæthral arrangement, and to which the words of Vitruvius are directly applied, was only two hundred years ago architecturally intact, and had suffered but few alter-

[1] Papers of the Harvard Art Club. No. I.

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ations. There is no reason to suppose that, at the time of the fatal explosion, the roof covering of the Parthenon was otherwise arranged than it was when first planned; no ground, certainly, for assuming that, if there had been a well-executed method of introducing light from above, it would have been closed and every vestige of it obliterated by the remodelling Christians, who, unable to make windows in the side walls, depended for their light solely on that which could fall through the apse at the eastern end. The darkness of the interior of the Parthenon is a subject of remark to all the travellers who saw it before the explosion; they recognized it as the intention of the builders of the ancient temple to exclude the light.[1] That the Parthenon roof of marble tiles was in its original completeness at the time of the bombardment is well authenticated. Tavernier, who wrote not far from the middle of the seventeenth century, speaks of the roof of the temple as "*aussi tout entier de pierres plates de marbre, tres-bien ordonnées.*"[2] A certain Major Sobiewolsky, one of the Hessian mercenaries employed at this disgraceful siege of Athens, writes at the time: "News having been brought by a deserter that the commander of the fortress had stored all his supply of powder and his valuables in the temple called that of Minerva, and that the most important personages were there assembled, as they thought the Christians would do no injury to the temple, the fire of several mortars was directed upon the building, at first without effect, principally because the roof over the ceiling (*das oberdach*) of the temple was somewhat slanting and tiled with marble, thus being well secured." There can be little doubt that these were the original Greek tiles, for the most part complete and in good condition.[3] We see from contemporary illustrations the wholeness of the roof. The portion above the naos had been rendered a little steeper than it was in antiquity, probably during repairs which had been occasioned by the decay of the wooden ceiling; possibly, though this is very uncertain, from the replacement of the flat-timbered ceiling by a barrel vault of masonry, which required a greater space between its spring from the upper interior entablature and the ridge of the slanting roof above it. The material originality of the roof is not to be doubted. Stone-work executed with the wisdom of arrangement and the precision of execution characteristic of that of the Parthenon is practically indestructible by the elements. The indolent race of Byzantine Christians and Turkish Mussulmans, who could only replace an overturned column by an unsightly mass of rubble masonry, were naturally incapable of re-covering the roof with delicately cut marble tiles. No traces of patchwork exist among its ruined remains.

It is needless to say, that the theory of the hypæthron did not exist while the upper part of a Greek temple was in such a state of preservation as in the Parthenon during the seventeenth century. Nor was it first broached by architects, or even by non-professional travellers familiar with the ruined remains of the monuments by personal observation. It was evolved from the inner consciousness of archæologists at a time when the authority of Vitruvius was considered the alpha and the omega of Greek architecture, and his work was held as a fortunately preserved oracle, which disclosed the methods by which the masterpieces of Greek architecture had been created, and might be reproduced.

But if the practical impossibilities be supposed possible, the architectural and æsthetical objections ignored, and an hypæthral opening effected, what would have been the effect of daylight in the interior? The sun's rays, changeable with every cloud, with the hours of the day, as well as with the season of the year, would have given at times a dull, at times a glaring light, mainly cast upon the hyperoon columns of the north, now slanting towards and now from the statue. Such changes of light would have been unrestful and intolerable in the sacred interior. It is natural to assume that the statue would not have stood directly beneath the orifice, but must have been sheltered from the wet under any fragment of covering which remained. Here the figure is consequently placed by all advocates of upper light. But in such a situation, under any protecting and projecting covering, the light would chiefly have fallen upon the feet and lower limbs of the figure, while the upper portion, especially the head, would have been in deep shadow, — an unfortunate position, but little calculated to show in their best aspect those masterpieces of sculpture which stood in the larger temples.

What was ideally required for the naos was not the changeable rays of the sun, but an even and steady light, gentle or brilliant, diffused or concentrated at will, such as the uncertain daylight can never give, with the best methods of introducing it. It is to be obtained by artificial illumination alone. In smaller temples, places of devotion, not of ceremonies, the contents were often little more than the artistically valueless symbolical statue. A single perpetual lamp was perhaps sufficient to fill such an interior with a twilight, which precluded an over-close examination of trivial and distracting details. Sharp and all-disclosing light is inappropriate to such a sanctuary; the low flame, of itself mystical, gives a breadth and awe-inspiring character to the place, allows a dusky half-perception and an undisturbed flight of the fancy. Thus do we to-day find the darkness of grottos and of ancient crypts broken but slightly by glimmering tapers and dimly burning perpetual lamps, at those impressive places of pilgrimage and devotion which the wise and understanding Catholic Church provides for its votaries. Even in large cathedrals, the bright daylight is in a great degree excluded by stained glass, and notably, in impressive services, by draperies and window hangings. Nocturnal ceremonies are well known as exciting religious fervor and ecstasy in the highest degree. To chant the lamentations of the Roman Passion-week in a room lighted by the sun, especially if so immediately exposed to the open air as to be practically out of doors, could not be otherwise than to render them ineffective. The scanty light of the few altar tapers, the diminution even of these by successive extinction, combine with the monotonous chanting to prepare the mind for the reception of such impressions as are produced by the music of Allegri. Similar necessities lead to similar expedients. The poetical Greek architect did not prepare without purpose such a transition from the crude and harsh exterior light as was afforded by the veil of shade given by the pteroma, — a change, a modulation from one kind of light to another. The darkness of the pronaos was the preparatory dissonance which intervened between the common and varying light without, and the soft and rich artificial illumination within. One cannot believe that he who had traversed the wildest part of the Attic landscape to offer vows to Nemesis, who had wound his way through dense Arcadian forests to supplicate at the mountain-seat of the healing Apollo, found himself at an enclosed court, lighted by the passing mood of the day, whose heat may already have oppressed, whose gloominess have saddened, the traveller; but rather at a shrine illuminated by tranquilly burning flames, separated from all outer influence, whither no excessive wind or heat, no rain or other baneful effect of nature, could penetrate, where no harsh sound of passing bird or beast, no disturbance of the outer world, could interrupt the sacred peace. The cares of the continual struggle with nature and the elements, which devolve so oppressively upon man, were excluded by the massive and enduring structure of the sanctuary he had erected.[4]

In larger temples the case was otherwise, and a brilliant and splendid illumination was often necessary. It was to the proud and elevated mind of the patriotic citizen that its heightened effects were addressed, not, as in the former case, to the suppliant praying at the silent shrine of the mystical deity. For such festive ceremonies, artificial illumination is equally adapted. Where a brilliant effect is desired in our dim daylight churches, it is best obtained at night by some such expedient as the cross of flame uplifted in certain cathedrals of Europe on the evening of Good Friday. No one who has ever seen this impressive spectacle can forget its magical light, concentrated and powerful, which no conceivable arrangement of windows could rival. The interior of the larger Greek temples must have been gorgeous beyond comparison. Here were most valuable works of art, paintings, tapestries, musical instruments, utensils of precious metal, — of the finest workmanship and the greatest splendor. Here were collected the offerings of states and families, as well as of individuals, bearing that stamp of beauty and thoughtful refinement given by the Greeks, even to the vessels of daily use.[5] Within the temples of Zeus and of Athene the prizes won by Olympian and Panathenaic victors were conferred. Hither turned the festal processions. Here, as in our theatres (which can be given as a second parallel, the offices of the Hellenic temple being to-day divided between churches and theatres, in as far as these latter are used for festive purposes), the light of day could not possibly answer the requirements. He may judge of the impressiveness and

[1] See especially Jacob Spon, *Voyage d'Italie, de Dalmatie, de Grece et du Levant fait és Années* 1675, 1676, Lyon, 1678; De la Guilletière, *Athenes ancienne et nouvelle*, Paris, 1676; and Sir George Wheeler, *Journey into Greece*, London, 1682.

Thus the eminent antiquary, Spon, says (tome ii., p. 152): "Il faut que je vous avoue qu'étant entré dans la Mosquée [the Parthenon, then used as a mosque], je ne fus pas étonné comme d'autres, de son obscurité, quoy que j'observasse que toute la lumiere qu'elle reçoit vient du fond que les Chrêtiens avoient ouvert en faisant le chœur; et qu'ainsi du tems des Payens ce Temple n'avoit aucun jour que celuy qu'il pouvoit recevoir par la porte, et qui s'affaiblissoit en venant dans le pronaos, qui ne recevoit aussi de clarté que par le premier portail. Je ne voulus point critiquer le dessein de l'Architecte Ictinus, qui l'avoit bâti; j'aurais même été plus surpris d'y voir des fenêtres, qu'il est bien plus difficile de trouver dans les Temples anciens. Mais est-il possible qu'ils fissent leurs Temples sans jour? Ouy, sans doute." Spon goes on to enumerate other instances of temples unlighted from without: "Sans aller plus loin qu'Athenes, il y a le Temple de Thesée qui ne reçoit de jour que par deux ou trois trous, que les Grecs y ont fait dans la voûte sans aucune symmetrie, lorsqu'ils s'en sont voulu servir d'Eglise, et l'on reconnoit bien que du tems des Anciens il n'y en pouvoit venir que par le seul portail. . . . . Ils s'imaginoient sans doute que l'obscurité avoit quelque chose de plus majestueux, et qui imprimoit plus de respect à ceux qui entroient dans ces Temples C'est apparemment de là qu'est venu l'usage des lampes dans les lieux sacrez." Spon's companion, Wheeler, in his *Journey into Greece* (London, 1682, p. 363), essentially repeats the observations of his more learned associate. He says: "When the Christians consecrated it [the Parthenon] to serve God in, they let in the light at the east end, which is all it yet hath."

[2] See *Les six Voyages de Jean Baptiste Tavernier, en Turquie, en Perse et aux Indes*, etc Paris, 1679, p. 354.

[3] Major Sobiewolsky goes on to say, that "ein lüneburgischer lieutenant aber, derselbe erboste sich, *in den* Tempell Bomben einzuwerffen, welches auch geschehen in dem eine davon durch den Tempell gefallen und eben in der Türcken vorrath von Pulver." This extract from the Marschroute of Major Sobiewolsky, referred to by the Count de Laborde in his *Athènes aux XVe, XVIe et XVIIe Siècles* (Paris, 1854, tome ii., p. 151), is printed by Michaelis, *Der Parthenon*, p. 346.

The bomb probably found entrance through a hole in the roof. Wheeler, *Journey into Greece*, p. 364, says: "This Temple was covered outwardly with great Planks of Stone; of which some are fallen down, and are to be seen in the Mosque."

[4] A passage in the Life of Constantine by Eusebius has an important bearing on this question, as showing, first, that some temples were roofed, and, secondly, that their interior was dark. He says, that by the command of the emperor the roofs of some temples were destroyed, their tiles being taken off: ἑτέρων [ναῶν] δ' ἡ ἐπὶ τοῖς ὀρόφοις στέγη, τῶν καλυπτήρων ἀφαιρουμένων, ἐφθείρετο. Elsewhere the priests were ordered to bring out the images from their dark retreats, παράγειν εἰς φῶς ἐκ σκοτίων μυχῶν. *De Vita Constantini*, lib. iii., cap liv.

[5] The custom of dedicating valuable and finely wrought gifts is one of great antiquity. Aigisthos dedicated gold and marvellously woven stuffs, as a thank offering for his successful usurpation of the throne (*Odyss.* iii. 274). Hecuba, to avert the downfall of her unfortunate city, presented Pallas Athene with the most costly peplos in her possession (*Iliad*, vi. 269). Herculus dedicated tapestries conquered from the Amazons to the fane of Apollo, at Delphi (Eurip. *Ion*, 1141). The number and variety of the objects within the Parthenon can only be understood by a study of inscriptions which give a partial inventory. These inscriptions have been collected and illustrated by Michaelis, *Der Parthenon*, Leipzig, 1871, pp. 288-315.

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splendor that alone can be lent by steady artificial light, who attends by day a full rehearsal in a theatre, however well illuminated by windows or skylights, and compares this spectacle with the performance of the evening, under flames which brighten every point, which throw a brilliant light without shade and without disturbing reflections. Even a day-lit concert has something of a dreary and prosaic character. The rich and varied contents of the naos would have seemed a confusion by cold daylight, while flames increase the pomp of a crowded interior. Draperies, which by day hang heavily, with dull color, are lustrous and glowing when viewed by the lamp; artificial light heightens the richness of interior decorations and furnishings, while admitting and demanding more of them. The fanciful though wild and confused forms of rococo ornament retained, with right, their sway longer in theatres and palace halls destined for evening use than elsewhere, and for this reason. Artificial light makes it conceivable how the Greeks found such delight in statues of ivory and gold. Ivory is a ghastly substance to stand for flesh by daylight; its sallow, corpse-like complexion and the nature of its surface are repulsive. By lamplight it is seen to its full advantage as a material for the sculptor's use. Its yellow tints undergo a change, and its absorbent and translucent surface shows with splendor. Artificial light is the ideal illumination for an interior like that of the Greek temple. Its isolation from the forms and influence of the nature which surrounded it is thereby completed. The present Roman and Eastern churches adopted this ritual observance, with various other heathen ceremonies, sometime during the second century of our era, though, from their introducing natural light into the churches or houses of assemblage, the flames lost their original purpose of illumination and became merely a conventional symbol. A perpetually burning lamp had from its necessary position in the naos become a sign of the divine presence even to the Greeks. The extinguishing of one of these lights was deemed a most inauspicious omen, and it was one of the charges against the tyrant Aristion that, during the siege of Athens by Sylla, he allowed the sacred lamp of the goddess, that is of Athene, to expire for want of oil.[1] There was the never-dying light of fire in the temple of Delphi,[2] and the fane is spoken of as being presided over by Hestia,[3] a poetical image expressive of the nature of the illumination within. Pausanias mentions many temples in which such flames burnt, among them the temple of Hera, at Mycene,[4] which was destroyed by the fire of one of the lamps igniting some wreaths while the priestess was asleep; the temple of Demeter, at Mantinea;[5] that of Pan, near Megalopolis, etc. In the Athenian Erechtheion there was a lamp of gold[6] made by Callimachus, an artist to whom later times ascribed the invention of the Corinthian capital. It had a wick of asbestos, Carpasian flax as it was called, and its flame burnt for a year's time without being replenished with oil. This lamp was provided with a funnel of wrought bronze, which passed through the ceiling and provided an escape for the heat of the flame. Such a conductor would, of course, have been useless if the apartment opened roofless to the air for its light, and it cannot be supposed that these flames burnt pale beneath an hypæthron but little above them. We may attribute to the extensive use of artificial light, and compare with the ever-recurring fires in our theatres, the fact that there were few of the Greek temples which did not at some time suffer from fire, which necessarily must have proceeded from the interior to ignite the wooden ceiling of the naos, the only readily inflammable portion of the structure.

In view of these various considerations, notwithstanding the now general belief to the contrary, I cannot but believe that the Parthenon, the temples of Olympia and Poseidonia, in short, all true Greek temples, were covered with a complete roof and ceiling, and that the light by which they were illuminated was artificial.

J. T. Clarke.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK. MR. S. D. HATCH, ARCHITECT, NEW YORK.

In this design the third and fourth floors are devoted to the bed-chambers and other small rooms.

SCREW SCAFFOLDING.

This plate, and the article which explains it, are copied from a late number of the *Building News*.

NOTES ON CONTRACTS.[7] I.

Perhaps this society may be interested in a little discussion of some matters relating to building contracts. No architect needs to be told that a perfectly satisfactory form of building contract which shall secure the owner against any possibility of loss through the negligence or financial incapacity of the builder, and at the same time shall be so fair to the builder himself that the architect will not be tempted to hurry himself through the reading of it so as to get his signature before he quite understands the meaning of all the conditions, is hardly to be found. Every one has his favorite form, and in general, every one finds, in emergency, that his favorite form has a vulnerable point, and some of the most essential particulars have never, within my knowledge, been so expressed as to be at once satisfactory to both parties and capable of easy enforcement.

In the general form of contracts much looseness prevails; some of the worst are those entered into for important public buildings, and many of us will think in our own minds that we are capable of drawing up as good building contracts as some that we have seen constructed by lawyers.

Perhaps, indeed, the most profound general knowledge of law may find assistance in the experience of architects, who have the deficiencies of ordinary agreements impressed upon their minds sometimes with considerable violence, but it is not less important for the practical man to understand the customs of law in regard to the enforcement of a contract, and the presumptions which will take the place of any condition omitted.

The contract itself is to be divided into two portions, the agreement and the conditions.

Though both are equally important, perhaps it is most essential that the first portion, commencing with the familiar words, "Contract for building made this blank day of blank," and ending with the covenant for payment by the party of the first part, should be absolutely clear and precise. While the subsequent conditions are generally explained more fully, the agreement is always very condensed, and every word is important. It is for this reason, probably, that in all English documents, and to some extent in our own, the agreement is written without comma or punctuation marks from beginning to end.

To be able to dispense with punctuation, a composition must be extremely clear and precise, so that it is at least a considerable help to accuracy of expression to make the first draft of an agreement without such aid; and there is a certain security in a document understood to be without stop, in that no one can surreptitiously add a comma, and so change the meaning of the instrument. Every one remembers the comma added to a certain tariff act, which cost the government and saved a small number of importers a million of dollars.

In the conditions, punctuation is generally necessary to explain the sense of the words, unless extraordinary effort is made to obtain sufficient precision to dispense with it.

The agreement being the most important part, it is well to make it include the essential provisions, such as that the work is to be substantially done, and in accordance with the plans and specifications, and completed by a given time. It is much more likely that the conditions which follow the agreement will be set aside, than the agreement itself, and to write the agreement without specifying the time of completion, and then put the time of completion in the conditions, would, perhaps, be to run the risk of not being able to enforce that portion, although if the time of completion is specified in the agreement a clause in the conditions explaining the circumstances which might modify the period allowed, or assessing the damages for delay, would be perfectly proper.

For instance, if one contracts with X. Y. to "build a house," and in consideration of such building to pay a certain sum, and afterwards adds a clause that "it is understood that the house is to be done in three months," it might not always be possible to prove that the clause was not inserted after signing, while if the agreement read, "to build a house and complete the same within the three months from date," etc., it would be unreasonable to suppose that any hiatus could have been left in that place at signing in which such words could be inserted afterwards.

Another custom among lawyers is to require that the agreement shall always mention the consideration. Of course an agreement without a consideration is void, but if a contract reads, "A. B. agrees to build a house, and in consideration thereof C. D. promises to pay him a thousand dollars," it seems as if all was said that is necessary; but I think lawyers prefer to state the fact a little more clearly, that "for the consideration hereinafter mentioned A. B. agrees with C. D. to build him a house, and in consideration thereof C. D. covenants to pay A. B. one thousand dollars."

I have a printed form of building contract from a law stationer in Boston which omits to mention the consideration in the first clause, but it is doubtful if that is the best way.

In the same printed contract, the structure is required "to be built agreeably to the draught, plans, explanations, or specifications furnished or to be furnished to said —— by ——." This will be seen to be at once too sweeping and too inadequate; too sweeping, because it binds the builder to work according to plans and specifications to be furnished at some future time, and inadequate, because it omits that important point, that the work shall not only be done subject to the directions, but to the satisfaction of the architect, and a subsequent clause in the conditions will not have the force that these words would in this place.

No intelligent builder would sign a contract for important work binding him to execute whatever future plans and specifications the architect might furnish, and if he did, it is doubtful whether the contract could be enforced. I have an impression that a contract worded in this way has been declared void by a court, but do not know the circumstances.

[1] Plutarch, *Life of Sylla*.
[2] Aeschyl. *Choeph.* 1018.
[3] Hymn. Hom. xxiii. in Vest.
[4] Paus. ii. 17.
[5] Paus. viii. 9.
[6] Paus. i. 26, and Strabo, ix. 1.
[7] A Paper read before the Boston Chapter of the American Institute of Architects, by Mr. T M. Clark, Fellow, Boston.

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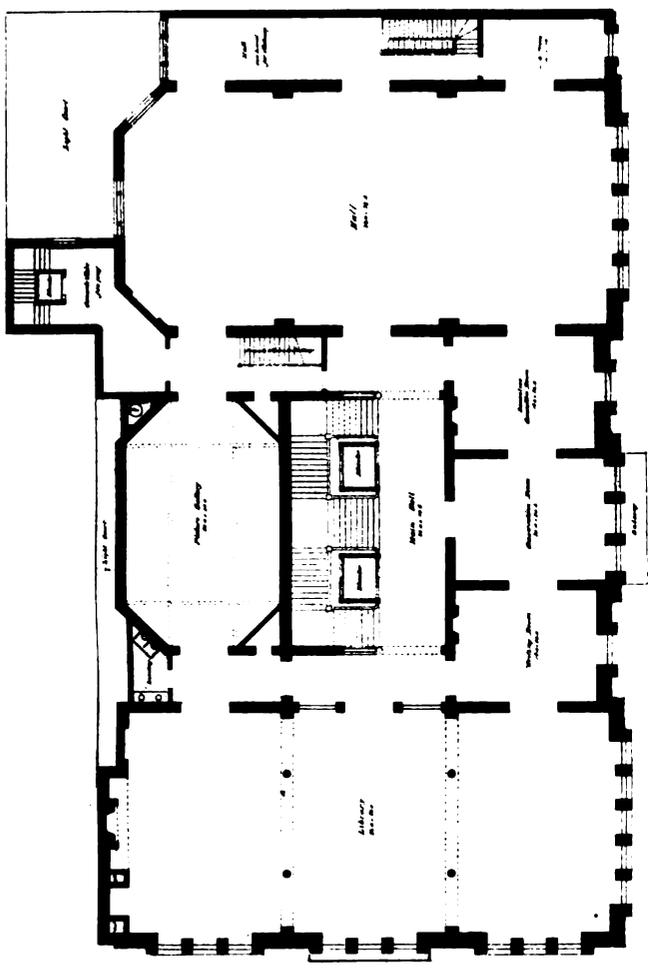
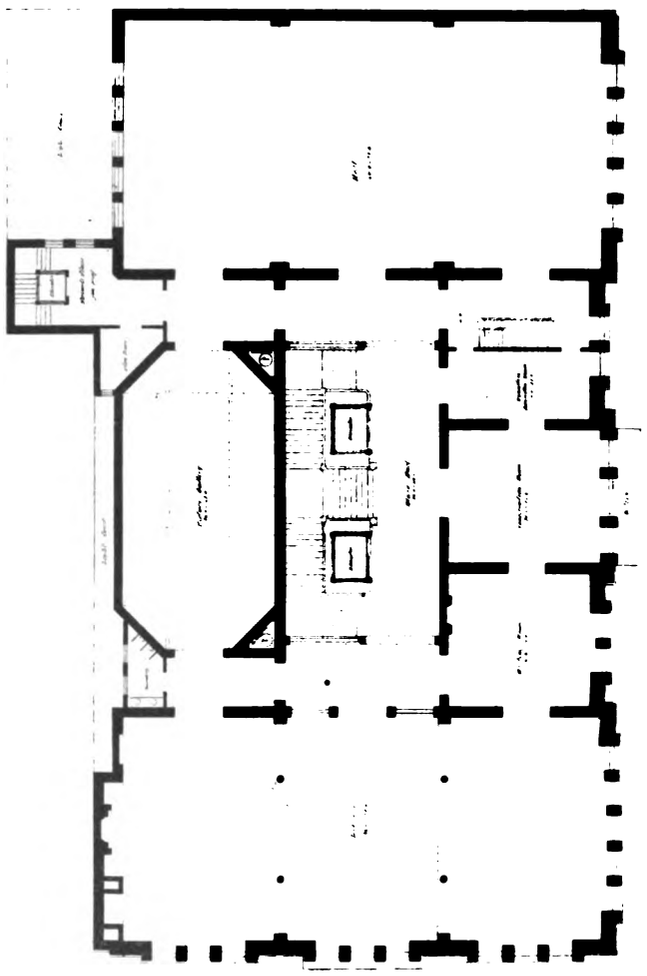


SUGGESTIVE PLAN A
—SECOND STORY—
—PLAN A—



SUGGESTIVE PLAN B.
—SECOND STORY—
—PLAN B—

THE HELIOTYPE PRINTING Co. 220 DEVONSHIRE ST BOSTON

DESIGN FOR UNION LEAGUE CLUB-HOUSE.

S. D. HATCH, ARCHITECT.

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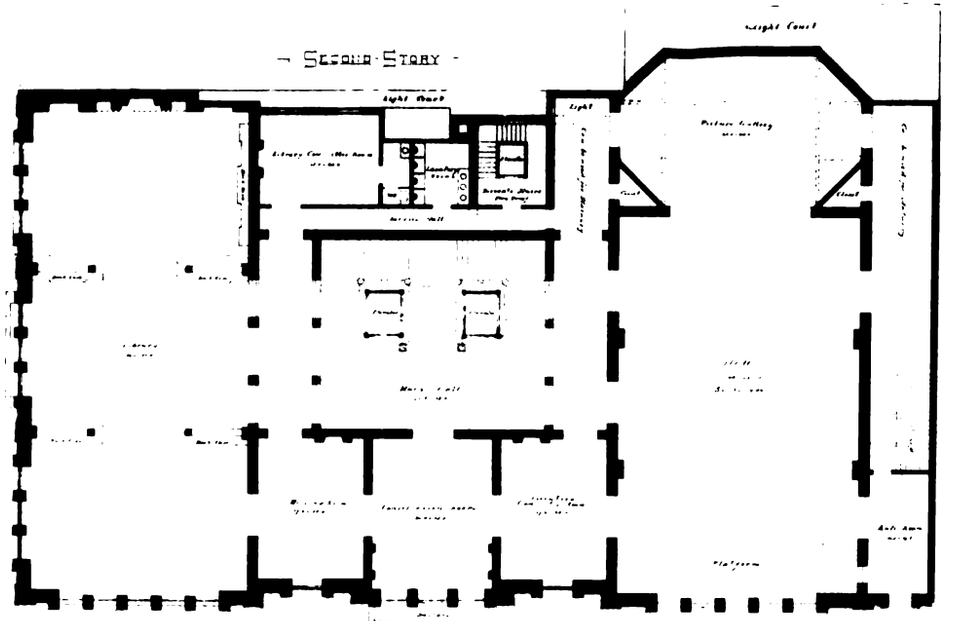

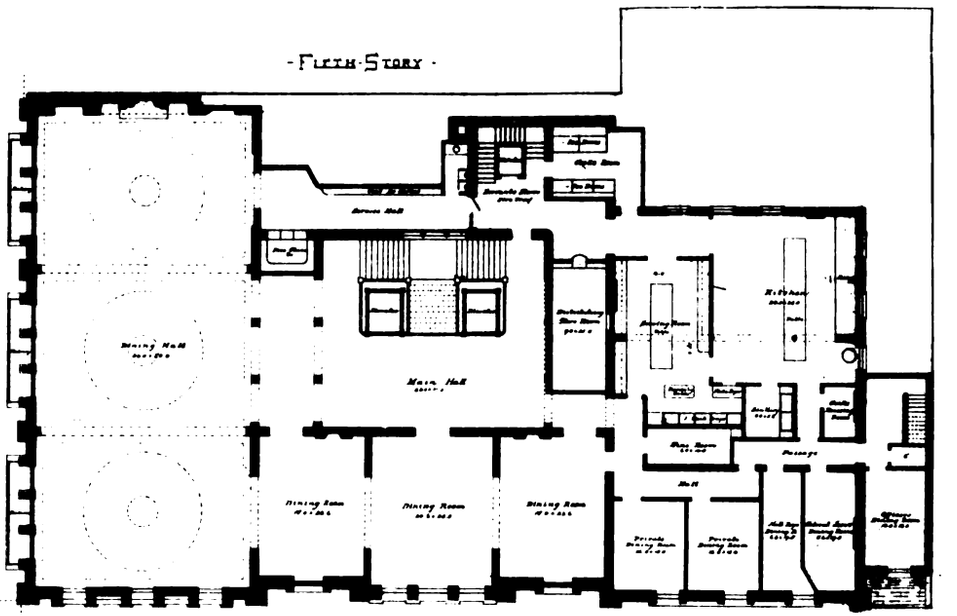

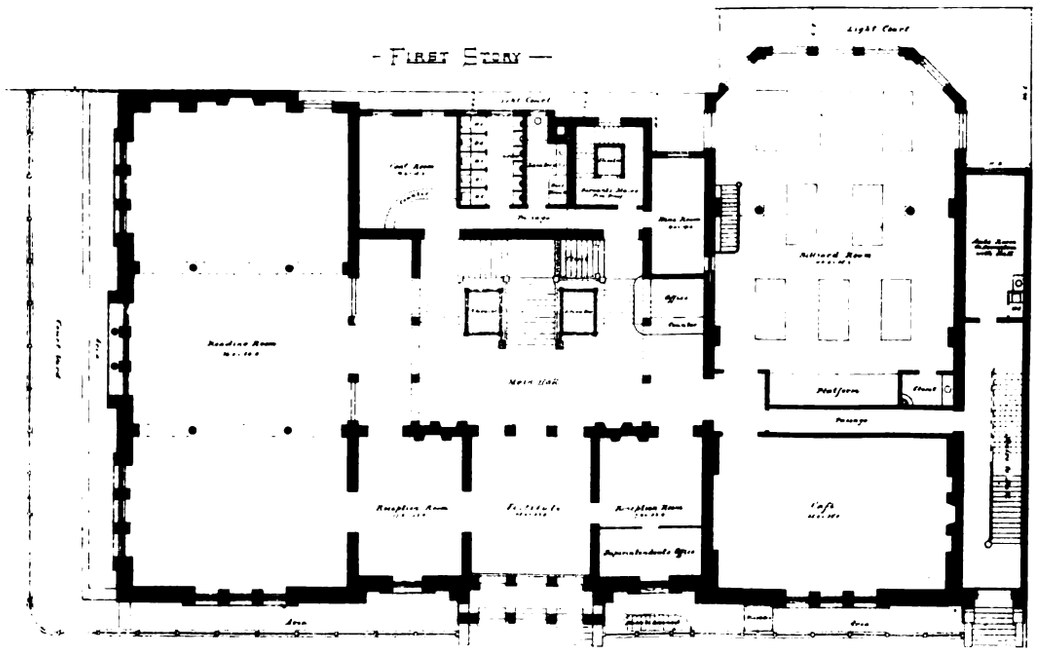

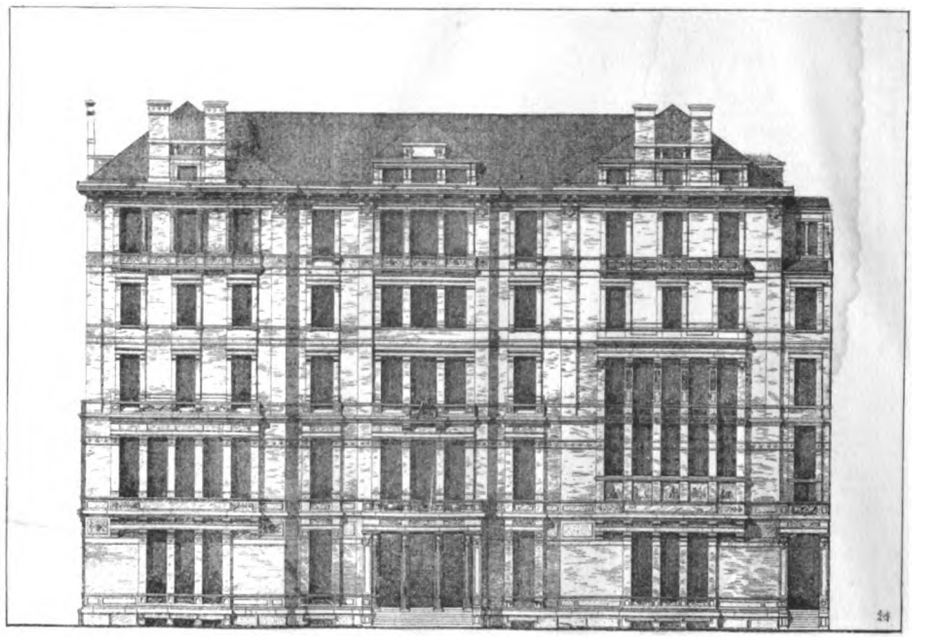

THE HELIOTYPE PRINTING CO. 230 DEVONSHIRE ST. BOSTON

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S. D. HATCH, ARCHITECT.

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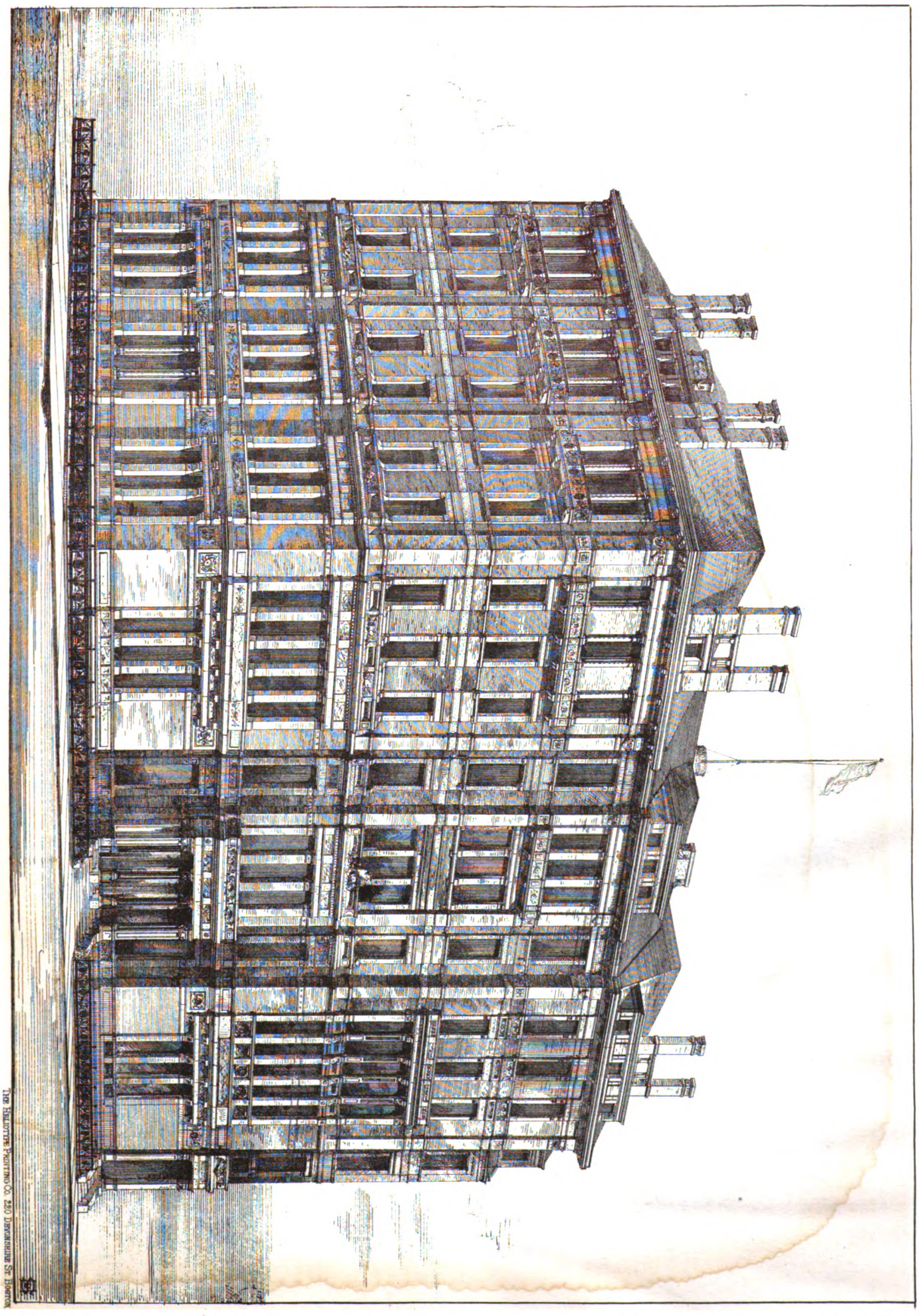

DESIGN FOR UNION LEAGUE CLUB-HOUSE.

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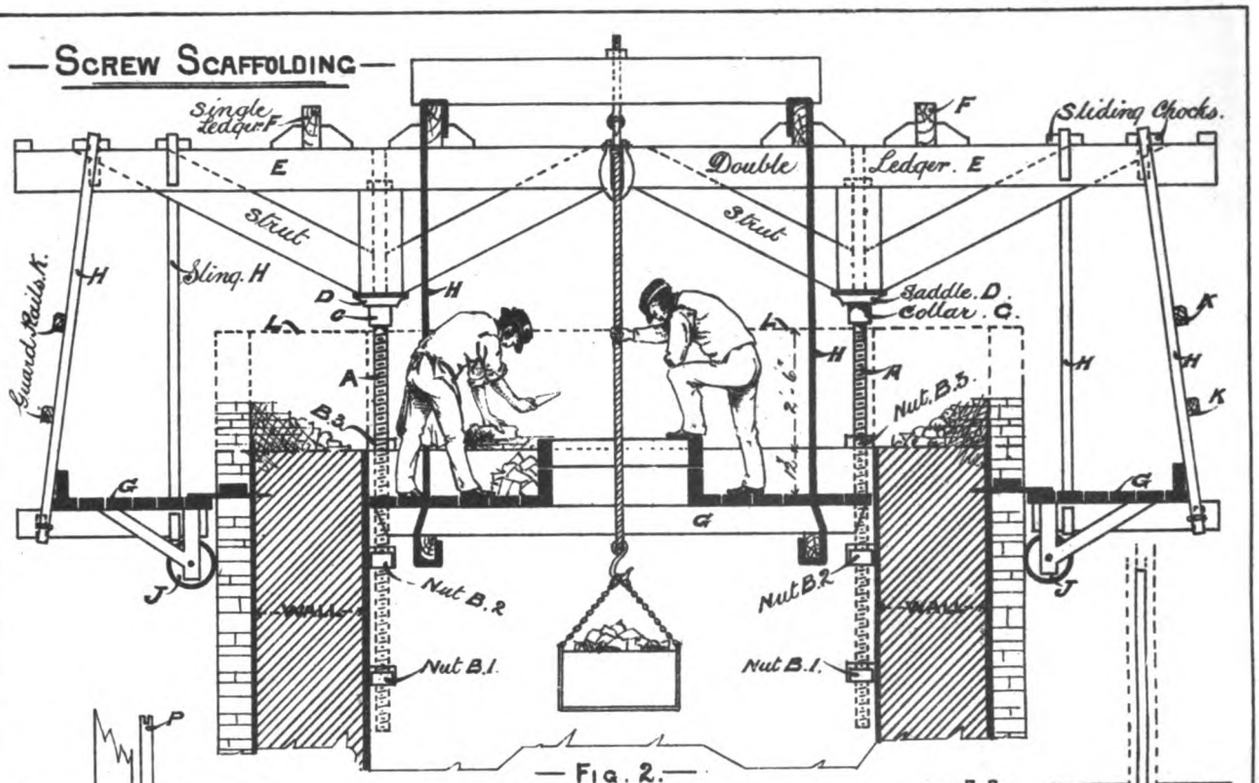
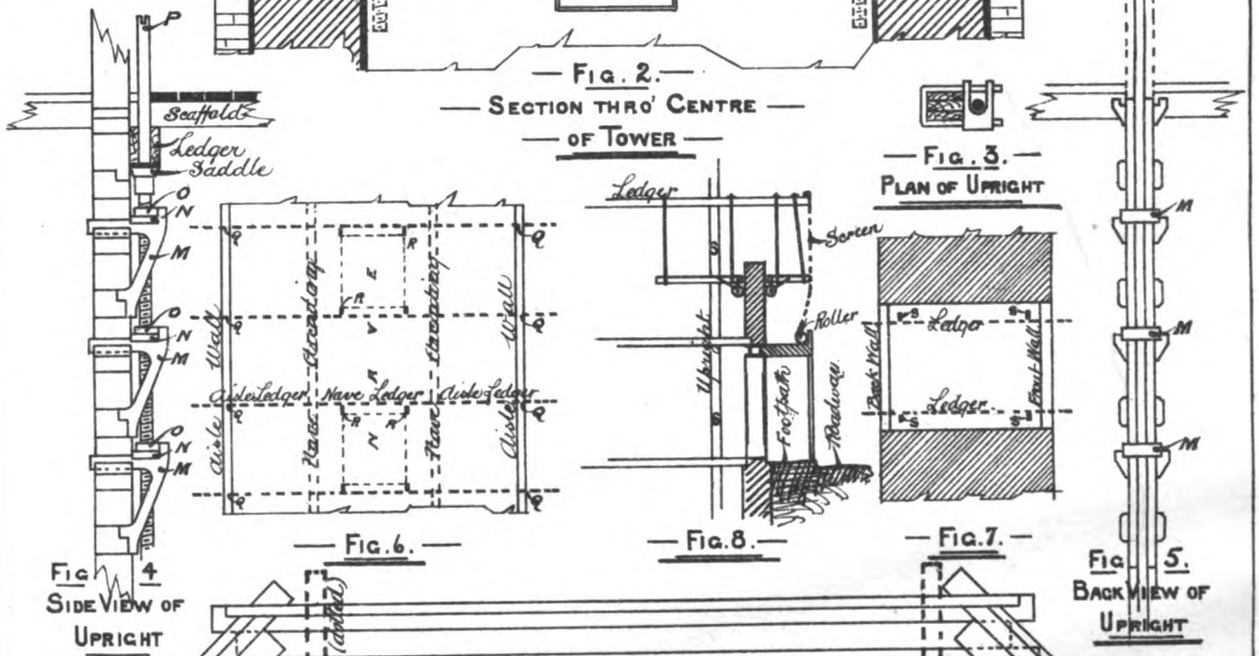
SCREW SCAFFOLDING



— FIG. 2. —
— SECTION THRO' CENTRE OF TOWER —



— FIG. 3. —
PLAN OF UPRIGHT

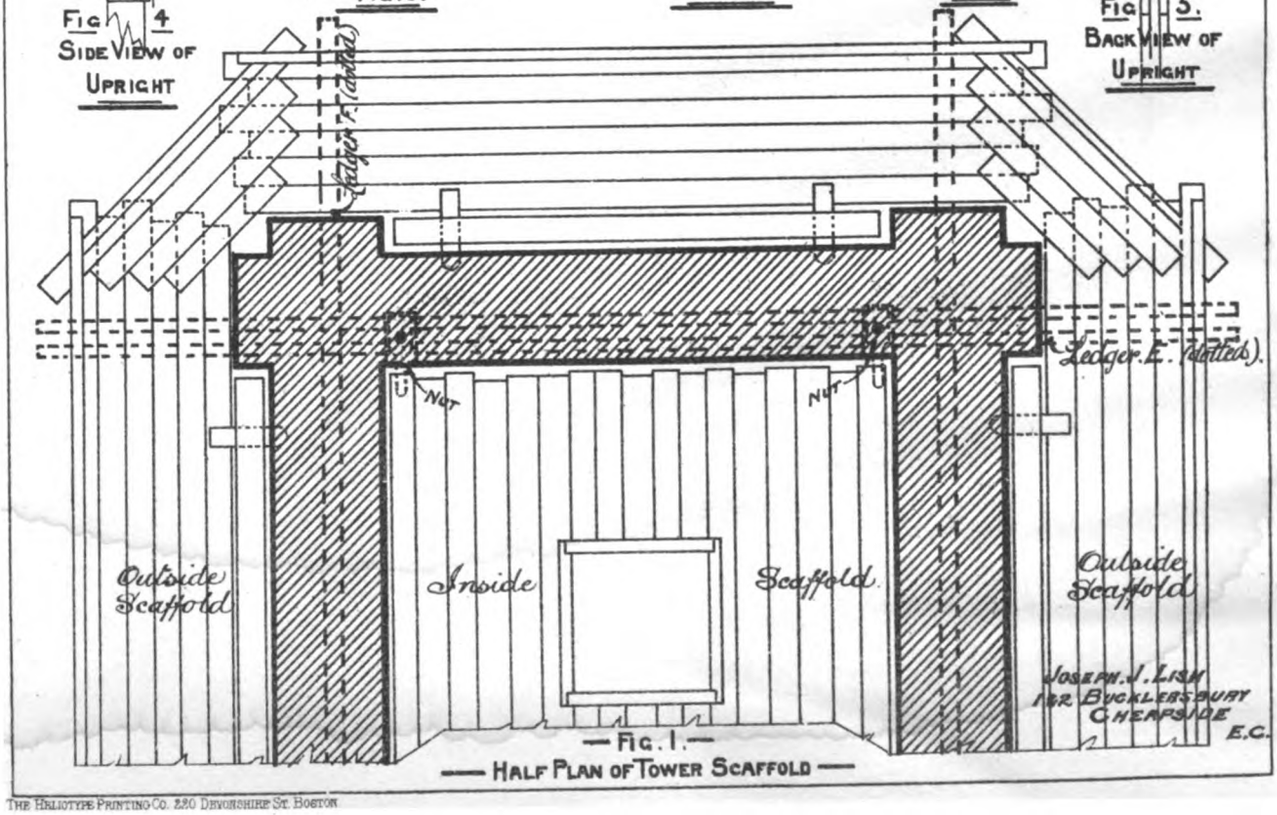
— FIG. 6. —

— FIG. 8. —

— FIG. 7. —

FIG. 4
SIDE VIEW OF UPRIGHT

FIG. 5.
BACK VIEW OF UPRIGHT



— FIG. 1. —
— HALF PLAN OF TOWER SCAFFOLD —

JOSEPH J. LISK
162 BUCKLERSBURY
CHEAPSIDE
E.C.

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In Sir Edmund Beckett's Book on Building, a variation on the accustomed formula is suggested, thus: "The contractor is to execute the work according to the drawings and specifications, and including all things which in the opinion of the architect may fairly be inferred from such drawings and specifications, although the same be not therein specifically expressed, subject to the directions from time to time and to the satisfaction of the architect." It will be seen that this, while making the agreement refer to definite, existing plans and specifications, does not at all exclude the use of future detail drawings to explain the contract drawings, while it would exclude, as is perfectly right, details which contradicted or varied materially from the contract drawings, if the builder did not choose to accept them, and it sets forth plainly and makes part of the agreement the principle which multitudes of laws have established, that the architect is the proper judge of what he meant by his own drawings. Nothing is so important in an agreement as to have every indefinite point, about which there might, in the future, be a difference of opinion, brought to the light, and fixed by the consent of both parties. I have never known a builder make any objection to this little sentence, and it removes the occasion for a host of quarrels, arbitrations, suits, and bitter feelings on the part of architect, owner, and contractor.

However small an affair the subject matter of the agreement may be, it is best to pay due attention to the clear expression of all the conditions. I had once, in the early days of my professional life, the care of a large building under construction by days' work, and I had to make bargains for all kinds of materials and work which would generally be taken care of by the contractor. The agent who managed the estate was a very experienced lawyer, and looked after my transactions with a sharp eye. Under his instructions I made contracts for everything, even to ten dollars' worth of soap-stone for a fire-place, often drawing up and witnessing three or four such agreements a day. They were very short, always beginning "For the consideration mentioned below," or "hereinafter mentioned," then specifying the work to be done, and the time of completion, or "to be done as soon as practicable," and ending with the amount of the payment.

After all, the trouble which the making and signing of such papers gave was inconsiderable, and the feeling of security against future misunderstandings and extra charges was of much value.

It takes so little formality to make a binding contract that we need to be on our guard not to find ourselves involved in one without intending it. It is well established that a bid tendered by a builder for a job, and a written acceptance, or acceptance before witnesses of the bid, constitute a valid contract, and the owner may find himself committed to an agreement in which the time of completion, the terms of payment, or other conditions on which he desired to insist, are left out, and the builder can refuse to have any such conditions imposed upon him beyond what a jury, probably composed of his friends and dependents, may consider reasonable. The proper precaution against such mishaps is to accept bids always with the condition that the bidder shall sign a satisfactory contract. A conditional acceptance of this kind is always allowable, and a builder is likely to be much more tractable in regard to the stipulations of the contract under such circumstances than when he knows that the owner is already bound by a contract in which the advantage is mostly on his side, and any conditions he may submit to are merely polite concessions on his part.

But if a duty and the consideration therefor, expressed in the simplest terms, constitute a good contract, no promise, though entered into with the most solemn sanctions, is valid without a consideration, or with the consideration omitted from the document in question, except by a special device, — that of the seal. The seal, in the language of the books, "imports a consideration," and while a contract in due form, with the agreement and the consideration expressed, needs no seal, and gains nothing by having seals attached, a bond or similar promise to do a certain thing without consideration is not valid without one.

Still, building contracts are frequently sealed under legal advice, and perhaps a distinction may be made that where an adequate consideration is mentioned for all the things which the builder agrees to do, no seal is needed, but where conditions are inserted, such as that the "materials shall become the property of the party of the first part as soon as they are delivered on the ground," or similar stipulations, where the thing to be done is such that it has not a pecuniary value, or one that cannot be estimated, and yet its enforcement is desirable, it may be necessary to affix seals to the signatures to cover such conditions. At least, the addition of the seal can do no harm in such cases.

One very common clause in contracts, which is far better omitted, is that providing that all differences shall be settled by arbitration, the manner of appointing the arbitrators being minutely described. Builders sometimes insist on this clause, and with reason, for its operation is commonly in their favor, but it is very wrong to suppose that just settlement of disputes cannot be obtained without the cumbrous and uncertain process of arbitration. No one who has gone through a contract with a bad-tempered builder, and endured his constant demands to "leave it out" whenever the owner ventured to resist his absurd claims, will wish to subject himself to similar annoyance if his contracts can be as well enforced without the arbitration clause, and it seems certain that they can.

Every one does not know that this same arbitration clause is not even binding. No matter how strictly any one agrees to decide his disputes without recourse to law, all such agreements are void, under the principle that no covenant can be made to "oust the courts of their jurisdiction," or, as one judge says, "no one can waive his right to have his suits determined at the courts provided by the laws of his country."

If, therefore, either party in a dispute refuses to submit the case to arbitration, the law will sustain him, no matter what the wording of the contract may be. But this refusal, it is important to observe, must be made before the difference is actually submitted to arbitrators, otherwise the courts will probably refuse to interfere, and when the award is made will enforce it, unless there is evidence of fraud or incapacity on the part of the arbitrators.

In general, arbitrations are unsatisfactory to either party. The temptation to "split the difference" between the disputants is very strong, and this is sure to displease both; and the arbitrators have by law the right to collect pay and expenses for themselves out of the subject matter of the dispute before dividing the residue between the parties; so that any expectation that arbitration will be cheaper than a lawsuit is very likely to be disappointed, especially if the case is a difficult one.

For greater facility in obtaining damages for breach of the contract in any particular, the parties bind themselves in the penal sum of so many dollars, usually about a third of the amount of the contract. This, instead of being a sum which the builder shall forfeit if he does not finish the work on the appointed day, as I have known them imagine, is the amount to which the parties agree that each shall be held responsible, in case of a breach of any of the conditions.

If the builder neglects to cover in the walls, in bad weather, when required by the contract or the accompanying specification to do so, and the work suffers damage, it is much more simple to take the contract into court and say, "This party agrees here over his own signature to pay for any breach of the conditions up to one thousand dollars, and I have therefore a right to pay myself for the damage out of that sum," than to begin from the first principles, and show that one has been damaged, that the builder was the cause of the damage, and that although he did not say anything about paying for losses of the kind in the contract, where he would have been expected to do so, still he ought to be held liable, to which there might be several defences.

SCREW SCAFFOLDING.

THE following is a description of the scaffolding referred to in my letter on "Building Machinery," which appeared in the *Building News* of April 25: Fig. 1 (see illustration) is a half-plan of, and Fig. 2 a section through, the centre of tower, showing the screw scaffolding in position. A A are four scaffold screws, which bear the whole scaffolding of tower, one being placed in each angle of wall. Each screw is shown to work (see Fig. 2) through three nuts, B1, B2, and B3, and has a collar C, carrying a saddle D for the support of the ledgers E F and framing, from which the workmen's platforms, or scaffolds, G, are suspended by wrought-iron slings, H. The wheels J of the bearers to outside scaffold travel up the face of the wall as the scaffold rises. Guard rails, K, are fixed where required, to insure the safety of the workmen employed.

In proceeding to fix the scaffolding, where the scaffold screws are to work in the wall, all that is necessary is to place the screws A A in their proper position in the wall whilst the foundations are being put in, then plumb and build round them, clasping two of the nuts, B1 and B2, on each screw at the same level, and at the required distances apart. If 2′ 6″ of wall are to be built for each lift of scaffold, the nuts will require to be placed every 2′ 6″ in height. The screws should next be turned until all the saddles, D D, are standing on the same level; the overhead framing, ledgers, and platforms should now be placed in position, the nut B3 clasped on where shown, and the work of building from the scaffold begun.

If the platforms G G are placed about 12 inches below the top of the wall then built, sufficient space will be left between the top nut, B3, and the collar C to allow of building up to the line of L, as required before raising the scaffold. The scaffold platforms will then be standing at about the best height for effective work, as the workman will, by such an arrangement, always be walling from just below his knee to about the level of his elbow, thus avoiding undue stooping and over-reaching.

When the 2′ 6″ of wall has been built all round, the workmen, whilst standing on their scaffolds, turn the screws A A (by a simple arrangement at the collar C), and raise the scaffolding, walling materials, and themselves as well, a height of 2′ 6″. The foot of the scaffold screw will then have passed the bottom nut, B1, leaving it lying loose in the wall. This nut must then be drawn out of the wall (a hole opening to the inside being left for this purpose), and clasped on to the scaffold screw at the level of L, making it thus a top nut. When, after the next lift of scaffold, the foot of screw has passed up through nut B2, this nut, in its turn, is lifted up and made a top nut; and so on successively until the full height of wall has been built. It will thus be seen that a screw never rests in less than two nuts. As the screw by this system travels up with its scaffold, the same screws will do for any height of wall. There is no necessity to clear the

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platforms previous to raising. Before commencing to plaster, the nut holes in the body of the walls are filled up, and the holes left by the screws are well grouted.

For "cleaning down" the work the outside platforms can be lowered as required from the projecting ends of ledgers.

The scaffolding screws can be used in three separate ways: —

1st. Working in the body of the wall.

2d. Against one of the faces of the wall.

3d. Independent of the wall.

Figs. 1 and 2 show the first method, where the screws are seen to work through the body of the wall.

By the second method the screws are supported on iron elbows projecting from one of the faces of wall, somewhat after the manner of No. 3 arrangement.

Figs. 3, 4, and 5 are a plan and side and back views respectively of uprights for supporting the scaffolds independent of the wall, as per third method. These uprights are made of three thicknesses of deal (bolted together from time to time as the scaffold rises), half lapping as shown. When the scaffold platform has been raised to about the position indicated on Fig. 5, the upright is heightened by bolting on fresh lengths, as shown by dotted lines. M M are iron elbows bearing nut rests, N N, which carry and keep the nuts, O O, firmly in position. When the scaffold has been screwed up the bottom elbow, with its nut-rest and nut, is taken off and raised to a higher part of upright, and so on, as in the case of screws working in the walls. The screws, in this case, can be turned by applying a handle to the top of screw, at P, by the workmen standing on the scaffold.

In the church where this system of scaffolding was employed, screws were placed in the aisle walls, Q Q (see Fig. 6), for the support of one end of aisle ledgers, the other end of ledgers, together with the whole of nave scaffolding, being supported by uprights, R R, fixed about 3′ from nave arcading, to allow of working-space between the upright and the nave wall. When the walls of aisles had been built to their full height, the aisle ledgers were detached from the nave ledgers, and the nave scaffolding screwed up, stage by stage, for the construction of the nave arcading, clerestory walls, and gables. When no longer required for walling and roof-fixing purposes, this nave scaffolding was used by the plasterer and the decorator. After first coating the ceiling, all that was necessary was to screw down the scaffold platforms, stage by stage, whilst the walls were being first coated, and screw them up again for the second and finishing coats of plaster.

Figs. 7 and 8 indicate how this system may be applied in the case of an ordinary building in a thoroughfare. S S are uprights for four screws, which, in this case, carry the whole scaffolding. Where the screws are placed at long distances apart, it may be necessary to truss the ledgers or scaffold-bearers, and where the builder wishes to work with a minimum number of screws, trussed bearers will naturally suggest themselves. To prevent the possibility of brickbats and building débris flying out into the roadway, I have shown a screen along the front of the building suspended from the scaffolding. This screen, which may be a kind of rope netting, will uncoil as the scaffold rises (see Fig. 8). If the whole of the material for a work of this kind is raised in the interior of the building, and the outside scaffold platforms used for the purposes of setters merely (and not for walling materials), there need be but slight inconvenience, and little or no danger, experienced by the street traffic whilst building operations are carried on.

As to the covering-in of these scaffolds, reference to the sections will show that all that the builder requires to do for this purpose is to stretch tarpaulins or covers over such portions of the ledgers as will afford the necessary protection to the working platforms and walls. These coverings may be placed in position when the scaffolding is first fixed, as they add but little to the weight, interfere in no way with the raising operations, and go up with the scaffold without further attention or alteration.

There is no valid reason why the whole operation of building should not be carried on under cover, and the "waller" be placed in as good a position for doing his work as the "stone-dresser."

The arrangement here applied to scaffolding could be made available for the extension of existing buildings by raising the roofs entire, and adding to the walls as the roof rose, in place of the tentative methods now resorted to when "roof-raising" is practised. — *Joseph J. Lish.*

SLOW-BURNING CONSTRUCTION.

To the Editor of the American Architect:

Sir, — Before replying to the last communication of C. may it not be well again to define the issue between us?

My first letter was in reply to the allegation made by yourself, that the underwriters were "hostile" to architects, and I then took exception to the work of many who are called architects, as exhibited in the construction of city warehouses, churches, school-houses, and hotels, in respect to which structures there is admitted to be an opportunity to apply some of the methods by which cotton and woollen mills have been made exceptionally safe.

Whether the factory mode of slow-burning construction can be imported into the building of dwelling-houses is a matter which I am not competent to decide. I can only say that one of the most experienced mill constructors has built his own house of wood according to the solid or slow-burning method, and finds it suitable.

The same absolute necessity, however, does not exist in respect to dwelling-houses that applies to other buildings; they are protected by the watchful care of their occupants and are good risks to insure. Yet even in them some bad losses and sad accidents have occurred from the spread of fire inside the concealed spaces of the walls furred off from brickwork with wood in the ordinary combustible way. Surely the frightful losses of life in, and the frequent combustion of, hotels ought to forbid the use of any but the safest method of building them.

I will now endeavor to reply to the criticisms of yourself and the questions of C.

In respect to your own comments, one requires proof. Have you any evidence that enclosing timber in common plastering will cause dry-rot? That would be a new fact to us. It is seldom that any timber in a factory is absolutely ceiled up in plaster, but sometimes it is, and we have no knowledge of dry-rot ensuing. Our attention has often been called to dry-rot speedily ensuing from *painting* or *varnishing* heavy timbers too soon, and from enclosing the ends closely in the brickwork, without leaving a small space for ventilation; but we suppose good plastering to be somewhat porous and rather to act as a protection to timber than otherwise.

In answer to C., I must admit a valid defence on his part, if our city school-houses are not built by architects. But how are we to know who is who in the profession? Well-known names are used in connection with buildings to which many of our objections as underwriters apply. A large public school-house but lately completed in this vicinity is open to all the objections that I have named. A large office building within my knowledge has steam-heating pipes in the concealed space between floor and ceiling in actual contact with the wood-work. A bank building has an opening over the stairway, well adapted to conduct the flame from the varnish on the wood-work into the hollow space between the false ceiling and the flat roof. If C. admits that such faults disqualify those who permit them to be called architects, then have I done grave injustice to the profession in using the title of architect in connection with them, but the men who planned these buildings claim the name and it is usually admitted.

In respect to hollow walls, it is possible that dampness might penetrate those tied with bricks so as to preclude fine decorations or paper being used, but we should infer from the dryness of factory walls laid in half cement mortar that there would be no such difficulty.

The thickness of the plank floors and roof *is* essential to the slow-burning principle, especially in respect to the roof, where it is apt to be most neglected, but *rough* plank and timber are not used; the planks are mill-planed, and the timbers are smoothed and the corners chamfered off. If necessary or expedient for yet greater safety, the ceilings can be plastered between the timbers on dove-tailed cleats, or with wire lath nailed close to the plank without furring or with only the thickness of a common lath for a furring. Surely the open timber gives opportunity for decoration in carving or in color; in a shop may not the open timbers be screened by mirrors set a little off and at an angle, so as to reflect the light from distant windows down upon the goods below?

In respect to the upper stories of warehouses used only for storage, I beg to ask C. which is the better way: to use double timbers, eight feet apart planed and chamfered, with a floor upon them of three-inch plank laid flat, planed, tongued, grooved, and beaded at the joints on the under side, or the ordinary construction, of rough plank for support twelve or fourteen inches on centres, covered with thin rough plank and a top floor of boards? What would be the difference in cost? Which is the best roof, open timbers and two and one half inch plank laid flat outside, or plank set edgewise twelve inches on centres boarded outside and ceiled inside, with a space the depth of the plank between? If the habit were changed and the methods of cutting the lumber changed with it, would not the factory method be as cheap as the present common and treacherous method?

C. says that partitions such as I have described would buckle under the weight of the floors unless very thick or interrupted by posts. Am I to infer that C. would consider it fit to depend upon a hollow combustible partition as a support for a hotel or tenement-house floor? If this is within the limits of good architecture I submit that there is reason for a mill constructor or an underwriter to be even "hostile" to architects.

In answer to the query of C. in regard to wire lathing and the method of using it, the letter sent herewith will suffice: —

Office Clinton Wire Cloth Company,
Clinton, Mass., June 27, 1879.

E. A., Esq.:

Dear Sir, — I note in the *American Architect* of the 21st current the request of the contributor C. for more information of the merits of wire lath; as our company has applied many acres of this lath to all kinds of buildings, I take this opportunity to say that we claim for such lath as meritorious qualities the following: —

It is not costly. It is fire-proof when covered with mortar. The mortar cannot be detached from the lath by any reasonable treatment, and any thickness of mortar that may be deemed advisable may be applied to it with the assurance that it will remain in place. It is easily and cheaply put in place, however uneven the surface, by the average mechanic. Ceilings or walls made with this lath will not crack if the superstructure remains in place. It stands the test of time better than any lath known. It will not corrode in any form of lime mortar, and also has many other qualities which we will not enumerate here.

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C. in his communication gives to iron lath a quality which it does not possess, namely, "the rapid corrosion of the wire, if the mortar should be for any reason gauged high enough with plaster of Paris to give it an acid reaction," etc.; and my reply to this will apply also to Mr. Wight, who, in his very able address made at Syracuse, said, "It is also liable to decay through the action of sulphate of lime in gauged mortar."

In order that this question may be settled intelligently let us examine the chemical constitution of plaster of Paris.

The plaster of Paris of commerce is invariably made from gypsum; gypsum consists of the neutral salt, sulphate of lime, and water; sulphate of lime is a natural combination of lime and sulphuric acid in fixed proportions, and the compound is in no sense acidulous or corrosive, the acid being perfectly neutralized and rendered inactive by its combination or union with the lime; but if it were possible — which it is not — for the sulphate of lime to be acidulous and corrosive to iron, the presence of even the smallest portion of the lime in the mortar used for gauging would be abundantly sufficient to neutralize the acidity and prevent any corrosion through the aid of its alkaline properties; it is the special quality of lime to neutralize and prevent any acid action by its presence in such mixtures; in fact, it is a chemical impossibility that the presence of plaster of Paris in "gauged mortar" can work as a corrosive on iron. So much for the chemistry of the case. In practice, we find the ceiling of the auditorium of the Boston Theatre, made by pouring liquid grout of plaster of Paris over the first coat of lime mortar, after a lapse of twenty-six years in perfect condition; such is the testimony of Mr. E. C. Cabot, the well-known architect, of Boston.

For partitions we have used this lath in many ways; in mills where we desire to get thorough fire-proofing, with a solid plank partition, covered on either side with the lath, and three fourths to one inch of mortar; in dwelling-houses with the common studding covered with wire lath instead of wood, the same lath being cut in between the studs and plastered as often as desirable, thus making a cut-off from currents of air, and consequently of fire; as also a *sure* protection against rats, at a much less cost than with bricks and mortar.

I hardly think that C. measured the full force of his statement when he said "the combustion of the lath would be slow as compared with that of the studding."

The universal testimony of firemen is to the effect that they find nothing so combustible as partitions made with wood lath, and nothing so troublesome for the reason that they never know where a fire in such partition may break out.

I fear I am making this too long for publication, but I shall be glad to give C. any further information on this subject.

Very truly yours, C. H. WATERS, V. P.

The difficulties in the way of architects submitting designs for factories, as stated by C., may perhaps be subject to a rejoinder. It is assumed by yourself and by C., that before any design can be had, a call for plans must be made by some one intending to build a factory, who is ready to pay for plans. How can such a call be expected when C. admits that much study would be needed even by the best architects before the simple requirements and advantages of a one-story factory could be comprehended, and that "such a plan would put a man *hors de concours* before a professional tribunal," lest the operations in the central portion of such a building should lack light and air? I beg to state for C.'s information that one of the conspicuous merits of the building under consideration is the great abundance of light in the centre and its admirable ventilation.

In other branches of business it is not customary for the one who assumes the charge to learn the elementary principles while conducting the work, and it could hardly be expected that the charge of constructing a great factory should be given to gentlemen of great ability in decorative art, but who would have studied the necessity of industrial architecture so little as to be likely to condemn a plan as wanting the very qualities which are among its greatest merits. If good architectural effect is wanting in our factories and workshops, may it not be for lack of the kind of study that would fit the professional architect to undertake them? And are there not some of the enterprising but younger members of the profession who can prove their capacity by submitting designs for your paper?

May it not be suggested that in most of the constructions of the professional architects, with a few conspicuous exceptions, the decorative art has been borrowed from styles and countries with which our necessary work and our climate have no analogy? Is there not a reason for the want of consideration exhibited by the mill-owner for the architect, in the fact that no truly national art or architecture has as yet been developed in the profession that is in any way adapted to the necessity of our work, to our materials used in building, or to the changeful conditions of our climate?

I can assure C. and yourself, Mr. Editor, that there are many mill-owners waiting for the men who will relieve our factories and workshops of their dreariness, and he who can give architectural effect without impairing the use of the buildings will be most welcome. When the discussions in your journal, the teaching in your schools, and the pictures in your pages give evidence that there are students who are qualifying themselves in this line, I am sure you will not be able to impute any "hostility," even on the part of underwriters, to them.

You say rightly that the open-timber roofs and the solid and honest work of some of our churches are due to the architect; but you must also admit that this method of construction had been adopted by the mill-owners at the instance of the underwriters as the common rule, long before there was a single example elsewhere.

I beg leave to submit a suggestion, taken from our experience, which may enable architects to stop fire and vermin from circulating in the common lath and plaster partitions of houses or hotels, at little cost: —

A compound consisting of four parts coal ashes sifted through a quarter-inch mesh, one part calcined plaster of Paris, one part sour flour, mixed in the same manner as common mortar, hardens into a very light, strong, and extremely porous substance, a most excellent non-conductor. For use on steam-pipes a little common hair is added to give tenacity. Such a mixture rises like a dough, and if placed between studs in a partition the expansion of the mass would force it into every crack. I do not know that it has ever been used for this purpose. I have a brick made in this way, and we are about to try some other compounds. The secret lies in the fermentation of the sour flour.

A compound of coarse sawdust and sour flour has great merit as a non-conductor of heat, and may be useful in many places, as it is almost incombustible. The use of loose sawdust as a packing should be avoided, if there is the least possible danger of oil and moisture being mixed with it, such a compound being very liable to spontaneous combustion. E. A.

P. S. The losses by fire in the month of May in the United States were $8,283,700. There were 695 fires among the risks that are classed as "specials." As usual, hotels head the list, the fires therein in May numbering 53, in one of which there was a considerable loss of life. E. A.

[The danger of dry-rot to wood imbedded in anything which cuts off access of air is one of the traditions of building which are not investigated nowadays because they have ceased to be questioned. It is noticed in all careful works on construction, and architects prefer accepting it as real to exposing their work to it for experiment's sake. Good authorities say that while it is generally dangerous to enclose wood entirely, as by bedding it inside a wall, it is most dangerous of all to enclose it in mortar, and safest in metal, as in the iron shoe at the end of a truss. The reason of this is not far to seek. Dry-rot, so-called, is not a different process from other decay; and is the result, not of absolute dryness, but of a small amount of moisture, either native or absorbed, from which the wood is not relieved by circulation of air. Anything which envelopes the wood closely, and can transmit this small amount of moisture to it, is likely to make it decay. The extreme case is that of a wooden post, which rots below ground while the exposed part of it is sound. Wood may even dry-rot from being enclosed in itself, if it is thick enough and does not crack, like the heart-wood of an old tree, or sometimes the middle of a large log.

A coating of plaster is porous, as E. A. asserts; enough so to transmit moisture, but not enough to allow a circulation of air through it unless there is a marked atmospheric pressure on one side, — from a wind, for instance. When the wood is as thin as a lath and exposed to the slow circulation of dry air which goes on in the interior of an ordinary partition, it is kept so dry as to avoid the danger. A close-fitting iron shoe, on the other hand, is absolutely impervious to moisture, and so may even protect the end of a timber, once securely dried. If E. A. does not like to trust the authorities on this point, we fancy that personal investigation will convince him, if he has opportunity for it. Should he know of trials which have lasted long enough to be tests, and which lead to different conclusions from the received ones, we should be glad to hear of them. The most apposite example which we remember in our own experience was the floor of a house which we once had occasion to examine, twenty years after it was built. The house was a costly one, and the upper boarding of the ground floor had been bedded in mortar, apparently as a protection against dampness from the cellar. The under side of the boarding was thoroughly rotted away, while the exposed side looked fair. It is quite possible that where one could insure a thoroughly dry air at all times it might be safe to bed wood in mortar; but mortar is very hygroscopic, and we should be shy of trying the experiment.

The other points of E. A.'s communication are addressed chiefly to C., and we will not forestall his answer. — EDS. AM. ARCHITECT.]

NOTES OF EXPERIENCE AND INEXPERIENCE.

BRICK-TIED HOLLOW WALLS. — In the issue of the *American Architect* for June 21, 1879, your correspondent C. desires that if any one knows a way to keep brick-tied hollow walls dry, he would describe the process. In reply allow me to suggest the following method, which, I think, will be found effectual. Instead of using brick ties to bind the walls together, let slate bricks or slabs of sufficient length and section to tie the walls thoroughly be substituted. As slate is a non-conductor of moisture, the desired dryness will be effectually secured. At any rate the undersigned has been accustomed to use a course of slate at about two and a half to three feet above the ground, to prevent the dampness from the earth rising in the walls, and has successfully prevented the same by this means.

CC.

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NOTES AND CLIPPINGS.

Hospital Ventilation. — It is said that Dr. John Swinburne, formerly Health Officer of the port of New York, has applied successfully to the Childrens' Hospital at Albany a novel method of ventilation. The wards run east and west, and the location is such that they are fully exposed to north, northeast, and east winds, and, to a degree, to winds from the northwest. The window openings are of unusual size, one third of the space being devoted to the ordinary glazed sashes, the remaining two thirds being fitted with several sets of sliding frames, on which is stretched moderately thin unbleached muslin. One or more of these frames, which are two or three inches apart, can be drawn before the opening so that the amount of air and light admitted can be regulated, and the temperature of the wards can be kept well under control.

Artesian Wells in San Francisco. — San Francisco is largely supplied with water by artesian wells, of which it is said there are not less than two hundred in the city. While in London and elsewhere it has been observed that the supply of each well decreased in proportion to the increase in the number of wells, such an effect has not been observed in San Francisco. In some of them the water is reached at a very small depth. One of the hotels is supplied by a well thirty-eight feet deep. Another has a well sixty feet deep, furnishing 6,000 gallons of water per day. A candle factory has a well one hundred and sixty-eight feet deep, which gives a supply of 10,000 gallons per hour. The *Chronicle* has been putting up a building, for which a new well is being bored, which is expected to supply 8,000 gallons per day. One reason for the large number of artesian wells in the city has been the extortionate rate charged for water by the corporations through which the city has received its supply. Like nearly all the corporations of California, these water companies have manifested an intolerably insolent and rapacious disposition. — *Exchange.*

Effect of the Electric Light on Color. — Professor Cohn, of Breslau, has just made a series of experiments on a large number of persons in order to determine in what degree their appreciation of color was affected by the electric light. He ascertained that as a rule the sensation of yellow is sixty times more vivid when the object is seen by the electric light than when seen by daylight, while red is six times and blue and green are about twice as vivid.

The New Episcopal Cathedral in Edinburgh. — The new Episcopal cathedral in Edinburgh is thought to be the most important specimen of Gothic architecture attempted in Scotland since the Reformation. It was the last, and many persons believe it to be the greatest, work of the late Sir Gilbert Scott. Its length is 278 feet (56 feet less than St. Patrick's Cathedral in New York), and its breadth 98 feet 6 inches (78 feet less than St. Patrick's), while the central towers, when completed, will be 300 feet high, and the two towers which flank the west front will be 209 feet 9 inches. In picturesque Edinburgh a more commanding site could not have been chosen, and the completed towers will form striking objects from all parts of the city. The portal is modelled after what remains of the splendid doorway of Holyrood Abbey, and the front as a whole will be, it is said, the most splendid Gothic façade in Scotland. Already the building has cost $800,000, and the entire cathedral, aside from the towers, will be ready for use at the end of the present year. Meanwhile the Church of Scotland, not to be outdone by the Episcopalians, is restoring the historic Cathedral of St. Giles, the original parish church of Edinburgh. Since the Reformation this structure has undergone many radical changes; a part of it having been used at various times as a place of merchandise, a prison, a council chamber, and a police office. Within its walls John Knox was accustomed to preach; indeed, his last sermon was preached there, and only a little way from it he lies buried. This national monument is associated with many incidents in the history of Scotland, among them the Solemn League and Covenant, sworn there by parliament, the assembly, and the English commissioners.

Monument at Fehrbellin. — This is the age of monuments. Germany will soon have written all her history in stone. On the 2d of September next, the anniversary of Sedan, now one of the great national festivals of Germany, a column will be erected at Fehrbellin in commemoration of the battle fought there on the 28th of June, 1679, when the great Elector overthrew the Swedes under Waldemar Wrangel. — *London Times.*

Temple Bar. — On the night of the 13th of June, 1879, the last vestige of Temple Bar was taken away by the contractors, and by this time the southern footway which joins the Strand and Fleet Street has doubtless been perfectly cleared of obstruction and (the boarding round Child's Bank, the rebuilding of which is nearly completed, having also been removed) there is on both sides of the great thoroughfare an unobstructed footpath. The south pier and arch were allowed to remain standing till the bank had been taken down, then the pick was laid to the foundations of the gate, which had been doomed since in August, 1874, an architect while walking cityward "perceived that the keystone of the arch had dropped and that the whole structure had sidled out of the perpendicular." The stones have been deposited on a vacant lot, awaiting the decision of the authorities as to their ultimate disposal.

Origin of Springs. — M. Zweifel, in the *Bulletin de la Société Industrielle*, combats the idea that springs owe their origin to rain-water. He shows, by the observations at many important stations, that the annual evaporation is largely in excess of the annual rain-fall, and that the earth, even in the most absorbent soils, is rarely moistened by the heaviest showers to a greater depth than forty or fifty centimetres (15.75 to 19.69 in.). Air, however, under the pressure of fifteen pounds to the square inch, can penetrate to much greater depths, and if we suppose that the saturation of the subterraneous air varies in the same manner as that of the superficial layers, the condensation of its vapor may account for all subterranean waters. The rapid increase in the amount of precipitation as we approach the earth's surface lends some confirmation to these views.

Effect of Steam Heat on Woodwork. — A correspondent of the *Northwestern Lumberman* makes a statement which has a bearing on all buildings in which steam-heating pipes are laid near woodwork, as well as on the dry-kilns with which he was interested more particularly. He says: "A few days ago, opportunity presenting, I made a careful examination of a dry-kiln, heated by steam-pipes, which has been in operation for the past three years. Cutting slivers from the ceiling and inside walls I found, in each case, that the wood had lost all tenacity of fiber, and was simply a mass of white charcoal. Holding a piece fully a half inch square in the blaze of a match it burned more freely than the match itself. On closely examining it I came to the conclusion that the resinous qualities of the wood were dried to such extent as to become a portion of the mass, and were thoroughly distributed through it, while the fibre was so thoroughly disintegrated, that on rolling the wood between the thumb and forefinger it rolled up into punk, and this punk flashed almost before it came in actual contact with flame. I am persuaded that under favorable conditions dry steam heat in its effect upon lumber but places it in proper condition for ignition under the sultry and piercing rays of a summer sun. A piece of glass upon the roof supplies at once the lens, which, concentrating the sun's rays upon a particular spot, will produce combustion almost at the instant. I have two suggestions to make, although so slightly skilled in chemistry, that I do not consider myself competent to enter into the subject to any extent: There are paints manufactured with a base of silica. I have seen buildings covered with this paint resist a conflagration which, having eaten up two blocks of houses in a village, found no barrier to its progress until the walls covered by this silica paint were reached, when its resisting quality manifested itself in stopping the onward progress of the flames. Could not the inner walls and roofs of dry-kilns be thoroughly treated at intervals with this preparation — the cost would be very trifling — and thus obviate the risk from fire? It is worth a trial. A friend who has a somewhat extended intimacy with the dry-kiln question has suggested an experiment once tried by him, the results of which were, to my mind, extraordinary. Its application, however, was confined to the roof. After putting up his walls he placed 6 x 8 joists across, from side to side, upon the upper surface of which he nailed laths about one inch apart; upon these he placed another tier of joists, 2 x 6, upon which he laid a floor; upon this floor he placed a layer of common earth, from the prairie, to the depth of six or eight inches; the roof was then put on about twelve inches clear above the earth, and with the natural slope. No matter what heat was maintained in the kiln, the under side of the roof was at all times coated with moisture, and this of itself would obviate the possibility of the resin in the wood of the roof becoming albumenized or carbonized."

Colored Photographs. — M. Cros prepares three photographic impressions of any object by sifting the light through solutions which will respectively arrest the green rays, the yellow rays, and the violet rays. The impression from which the green has been excluded, if developed under green light, will appear intensely green at points where the original was the greenest, and pale green or black at the green points where the green was mingled with other colors or was entirely absent. By combining the three negatives, and superposing the images by the help of reflecting prisms, he obtains an approximate solution of the fixation of colors by photography. — *La Nature.*

A Belgian Pantheon. — Next year, at the celebration of the fiftieth anniversary of Belgian independence, it is proposed to erect on one of the heights of the neighborhood of Brussels what a Belgian paper calls "a huge Pantheon, after the style of Westminster Abbey, to contain the portraits and statues of the great men, statesmen, generals, artists, writers, and philanthropists of that country."

The German Cast Iron Forts. — The new solid iron fortifications at the mouth of the Weser, in the north of Germany, have just been finished. There are three forts, containing nine 21-centimetre guns and ten revolving turrets, accommodating fifteen guns of 15 and 28 centimetre calibre. These solid iron structures have a total weight of seven thousand six hundred and fifty tons, present convex and oval fronts to the enemy, and are able to resist the heaviest artillery known. The loop-holes open at the moment of firing, being ordinarily protected by oval valves of the same solid material. Both batteries and turrets are provided with ventilating apparatus and hydraulic engines for working the guns. — *Iron Age.*

The Channel Tunnel. — A despatch states that the boring near Sangatte, in order to ascertain the depth necessary for the Channel tunnel, has been suspended for three months, on account of the quantity of fresh water encountered. The soil is clayey and very hard.

Ploughing by Electricity. — At a recent meeting of the Paris Academy of Sciences, M. Tresca gave an account of some experiments in ploughing by electricity which he witnessed at Sermaise, in the Marne. A Gramme machine, making 1,200 revolutions per minute, and driven by a steam engine, was connected to a second Gramme at a distance of 440 yards, and caused the latter to revolve at the rate of 1,140 revolutions to the minute, the electricity produced by the first machine being thus converted into work. The second machine was connected to a third at a distance of 219 yards, and these two worked cables attached to a double Brabant plough. According to M. Tresca, the experiment was very successful, the work accomplished representing the equivalent of three horse-power, while one half of the motive power obtained from the steam-engine was really transferred to a distance of more than one thousand yards from the furnace. — *New York Tribune.*

Scepticism in Art-Criticism. — The general tendency of art-criticism of late years, observes the *Saturday Review*, has been toward scepticism; more careful investigation has shown that the duration of human life is in many cases inadequate to the labors ascribed to the old masters. Accordingly many of the multitudinous frescoes long passing under the name of Giotto are transferred to his school or epoch; and in like manner Raphael is no longer credited with handiwork that is worthy only of his scholars. The wholesale manufacture carried on by Rubens is too notorious to require comment.

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THE *Evening Post*, commenting upon the case of Mr. Tolman, which we discussed a fortnight ago, says, with apparent disapproval, "Architects in this country hold that their plans, specifications, and details belong to themselves," etc. Our architects, however, in this do only what architects do everywhere else, and what in the experience of the world it has been found to be reasonable, and for the general convenience as well, that they should do. This is a doctrine which, to be sure, is commonly received at first as a paradox, but which may be trusted to enforce itself whenever it has been considered with due care. Accordingly, continues the *Evening Post*, if an architect designs a man's house, and uses his client's ideas therein, he is ready at once to sell the same design again to somebody else; and so "no layman is free from the liability of having a neighbor erect a dwelling-house precisely like his own." The point is, however, that the architect does not sell his design to the first client, or to any other; he only sells his professional services as a lawyer does, keeping his plans and other professional memoranda, as the lawyer does his notes of titles and his briefs, and using for each client such a design as he finds best suited to the client's wants. If he is an architect who takes pride in his work, he dislikes nothing more than to build one house precisely like another, it being his cardinal doctrine that each case demands an individual treatment, and he recalls his plans and details not that he may use them over again, but chiefly to spare himself and his client the common annoyance of seeing his design copied exactly by some unauthorized carpenter for the benefit of a person who pays nothing for the use of it. There are architects, it is true, not of a very estimable kind, who save themselves trouble, and earn their fees easily, by using the same design over and over again, and building one house just like another, as speculative builders do. This class of architects is easily avoided, if the client wishes; but as a matter of fact we believe it is a very popular class. As for the ownership of the ideas which may be pirated, it may be said that the architect usually gets little that is available from his client except information of the client's needs, the practical means of supplying them being the architect's stock in trade. The number of merchantable ideas which he receives is commonly very small compared with what he furnishes himself.

THE truth is that, though an architectural copyright would be for the immediate, if not the ultimate, advantage of architects themselves, it would probably be far from palatable to the public. Of all the ideas that clients bring their architects, the most conspicuous and the commonest is the notion that they must have a house like somebody's else. Almost every architect will recall, with a weary shudder, the typical clients who, after engaging him to design their houses, have dragged him from his drawing board to inspect the houses which they wished their own to resemble. We have never argued in favor of architectural copyright, believing that it would be too difficult of enforcement for practical use, or, if it could be rigidly applied, a check upon the development of an art that grows as architecture does by a common development and assimilation of current ideas; and holding that the best equivalent protection was in reserving to architects the control of their own drawings and in the growth of an intelligent feeling against absolute copyism. But if copyright is to be recognized, there is no doubt that it is vested first in the person who produces the work that may be copied. Neither copyright nor plans cease to become the property of the producer, except by virtue of a formal transfer, or an incontrovertible usage which implies a transfer. Such a usage does not exist in architectural practice, and such a transfer is not common. As far as security against copying goes, there is no one who has greater interest in checking it than the architect himself, who is more injured by it than anybody else; and there is no one, on the other hand, to whom the plans are less essential for copying a design than to him who has made it. In short, if clients wish to enjoy their own houses without seeing them copied, we advise them — after the obvious precaution of discouraging the copyism of other people's — to look out for an architect who puts his professional achievement first, and money-making second (of whom, fortunately, there are many); and then to cast their influence in favor of their architect's protection as well as their own, by the usage of keeping plans and drawings where they are safest, — in the hands of the architect himself.

ONE or two things occur to us as worth adding in answer to E. A.'s communication on factory construction in our last number, with regard to the employment of architects in such work. We leave it to C. to continue, if he will, the argument against the one-story plans, to which he committed the profession rather hastily, we think, and concerning which E. A.'s retort is effective rather as a rejoinder to C. than as an argument against architects. That men who have studied and practised the building of mills know more about it than those who have not, is a proposition that few persons will care to dispute. That architects commonly have not is probably true. But to assume that they could not or would not, if opportunity were afforded them, is unnecessary. E. A. says in substance, that it is not to be expected that men should be asked to do the work who are to learn to do it by doing it. Yet we venture to say that this is exactly the way in which the men who have done it learned to do it, so far as they had to learn anything different from what architects may be expected to know. Everybody in fact, in every business, except the mere student, learns how to do a new kind of work by special study when he has occasion to do it, as a lawyer studies a new class of cases, or a physician an unusual disease; and architects may be trusted as able to do this, at least if the way has been shown them. The only other question is whether architects are unwilling to learn, — are intractable, for instance, and too full of their own notions to take heed of their clients' wants, or too lazy to do their work faithfully. We doubt if E. A. or another client would find them so unless he made a very injudicious choice among them. There are many mill-owners waiting, E. A. tells us, for the architects who will relieve their factories of their dreariness. It is safe to say that there are many architects waiting who are ready to devote a good capacity and a fair amount of labor to the work when it is offered to them, — only if the best are wanted they will naturally wait to be asked. It is hardly to be expected that an architect who is in active practice will devote himself to studying a special branch of construction till he sees occasion to use the knowledge of it; but we are encouraged by E. A.'s statement to hope that for the capable young practitioner who will perfect himself in this particular branch there may be an opportunity in store. If any such will send us designs which are the result of special study we shall be very glad to receive them for E. A.'s sake and our own.

THE assertion that the open-timbered roofs and solid work which the architect has introduced into churches were anticipated by the mill builder "requires proof," but, if sustained, does not, so far as we see, affect the argument; for the precedents which architects have borne in mind are older by centuries than cotton factories, and the means have been in use from the oldest days. To extend the principle to buildings divided into apartments for studious or domestic uses is likely to be a slow task, there being but few clients who are underwriters or mill owners. An account of the experience of the owner who built his house in the manner of a mill would be of great interest to us and to our readers. Two or three questions suggest themselves: How was the system carried out? How expensive did it prove?

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Were the qualities which the owner required in a house such as would content most clients? Hollow spaces, as we have remarked, are commonly desired for their non-conducting qualities, and it has been found necessary to introduce them into outer walls, and sometimes inner walls, of masonry. Of course cheapness, including economy of time in building, is at the bottom of the trouble; for with cost the thing can be cured, and C. has put it clearly that when the risk is lifted off by insurance, the ordinary client finds it cheaper to let his house or his hotel burn than to build it substantially. It is our impression, in fact, as we have argued before, that the insurance companies, while they have benefited individuals, by saving them from intolerable losses, and so have given a valuable steadiness to the community, have retarded the progress of good building by relieving those who are responsible for bad building from the consequences of it, while their care to protect themselves, except in extreme cases, has gone in comparison but a little way.

The New York Board of Health apparently means to take advantage of the powers conferred upon it by the Tenement-House Act passed by the last legislature. The act clothes the Board with very full powers, and assigns it at the outset a fund of ten thousand dollars with which to enforce its authority, which fund is to be maintained by the fines imposed upon offenders under the law. The plans of all tenement-houses built or converted are subject to the approval of the Board, and the act provides a number of wholesome restrictions to which all such plans must conform. No tenement-house is to be built on a lot on which there is another building at a less distance than ten feet, and this distance must be increased by five feet for every story in height above the first; nor can any such house be put nearer than ten feet from the rear line of its lot. No continuous building built or converted for a tenement-house is to occupy more than sixty-five per cent of its lot, unless it is a corner lot. But in all these cases a discretionary power is given the Board of Health to relax the restrictions. It is also ordered that in new tenement-houses the rooms shall not be less than eight feet high, and no sleeping-room shall be without an outer window of at least twelve square feet of surface. In all rooms the outer windows must have a total area one tenth of that of the floor, and one, at least, of them must come within six inches of the ceiling. Where a room has no outer window it must have "over the door a ventilator of perfect construction," connecting it with one which is open to the air, "and so arranged as to produce a cross current of air." The Board has power to check the overcrowding of tenements or rooms, and to require a janitor in any house which contains more than ten families, and the right to sue for violation of the act, a penalty of ten dollars per day being provided for violation, which goes to the increase of the fund above mentioned. There are some passages of the act which might, we should think, lead to doubtful interpretation — as to what is a ventilator of perfect construction, for instance, and what produces a cross current of air — and there is perhaps a question whether, if a weak-kneed or a political board of health came upon the stage, their discretionary power would not turn out a delusion and a snare; but if the act is wisely enforced, although it is far from providing a reform for all the evils of a tenement-house construction, it will go a good way in improving the present condition of things.

A curious counterpart to the expected ruin of the Eddystone Lighthouse from the fall of the rock on which it is built is to be looked for, or at least feared, if we are to trust reports that come from Madrid, in the destruction of the Alhambra by the falling of the hill on which it has stood for six centuries. It is said that parts of the hill have already fallen, and there are indications of danger of a land-slide great enough to carry away the Alhambra itself, and the Alcazaba, or citadel, which adjoins it. There are not many buildings of a past age whose destruction would be counted so great a loss by the cultivated part of the world; perhaps none at all which would seem to the countrymen of Irving to leave such a void in the world. Probably, too, there is none whose architectural renown borrows so much from its picturesqueness and its romantic associations. Painters and lovers of the romance of history could better spare almost any other building. Its unique character, its picture-making qualities, the beauty of its decorative work, its superb site, and even its traditions, have lent a vicarious charm to its architecture in the popular reports. As a work of pure architecture, or as an example for study either for itself alone or for its place in the history of building, its loss, though a serious one, would be less to be deplored than that of many a less famous structure. The hope is expressed that it may be possible, by timely aid from engineers, to so buttress the hill on which it stands as to preserve it from falling, and with it the building.

The last election of the English Royal Academy seems to be looked upon as a concession to the popular judgment. Mr. Alma-Tadema, who was made associate three years ago, has been chosen fellow, and Messrs. Boughton and Herkomer are made associates. The advancement of Mr. Alma-Tadema, says the well-informed London correspondent of the New York *Tribune*, was, in a measure, forced upon the Academy by public opinion, there being among the conservative academicians a disposition to keep him longer on probation. This reluctance yielded, however, to the voice of popular favor and the prices commanded by the artist's pictures, even although according to the tradition of the Academy the vacant fellowship should this time have been given to a sculptor. The compliment is the more marked in that Mr. Alma-Tadema is not an Englishman (having been born in Friesland in 1836), while his manner of painting, being more French than English, does not appeal to the sympathies of the older academicians. It is unreasonable to complain of backwardness this time, for three years is but a short time for an artist to remain an associate. The tardiness was in the first election, for the artist had been twice medalled in Paris, and made Chevalier of the Legion of Honor, before he was chosen associate. He has been sneered at as a mere archæologist, for his fondness for painting scenes from classical life and his fidelity to historical detail; but his pictures, painted with rare manipulative skill, a power of color, a feeling for tone, and, above all, a sense of what makes a picture, which are very un-English, have made their way with the public, have been often engraved, and bring very large prices. His work is highly valued in the United States, being known, not only to Americans who have visited England, but at home through engravings as well as by a number of pictures which have been exhibited here.

The two new associates are also, to all intents, foreigners. Mr. Boughton, though of English birth, spent his boyhood and early manhood in this country, began his schooling in art here and finished it in Paris, only returning to England in 1861, when twenty-seven years old; so that Americans are inclined, with perhaps a rather forced patriotism, to claim him as an American painter, while his artistic affiliation is more French than anything else. Mr. Boughton is also well known and esteemed in this country, being a Fellow of the National Academy, to whose exhibitions he has often contributed, and having sold many pictures here. Mr. Herkomer, less known in the United States, is a Bavarian, whose training is mostly of the Munich school. His first great success was a picture of the Chelsea Pensioners, exhibited at the Academy in 1875, of which it is said that when it was brought up for judgment, the committee, "weary as they were with a long day spent in judging mediocrities, could not refrain from clapping their hands in genuine admiration." Since then Mr. Herkomer has steadily gained in reputation. Last year he won the grand medal of honor at the Paris Exposition, and he now joins the Academy at the early age of thirty. He is known as an etcher as well as a painter.

NOTES ON CONTRACTS.[1] II.

The ordinary contracts make no provision against the risk of loss to the owner through the bankruptcy of the builder, by which he is obliged to have his work completed by other parties, usually at an increased expense; but careful architects sometimes insert a clause to the effect that in case of the insolvency of the party of the second part the owner shall have the right to take possession of the work and materials, similar to the common clause providing a similar remedy for the neglect of the builder. With this clause, and a liberal reservation in the payments until the completion of the contract, the owner is at least in a better position than if he had to depend upon the assignee to finish his building, but he may suffer annoyance from attachments upon materials delivered at the works. Sir Edmund Beckett adds to his form of contract a little sentence, thus: "and all materials shall become the property of the party of the first part as soon as they are delivered on the ground," this being for the pur-

[1] A Paper read before the Boston Chapter of the American Institute of Architects, by Mr. T. M. Clark, Fellow, Boston.

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pose of preventing the parties furnishing the materials from attaching and removing them, if the builder should fail without having paid for them, leaving the owner, who very likely had advanced money on them, to suffer the loss. It seems hard on the lumber dealer, if by an agreement between the owner and contractor, in which he was not even consulted, he could be deprived of his right to recover his property wherever he could find it, unless he were paid for it, and I was disposed to question the wisdom even of the Queen's counsel, in inserting such a manifestly unjust stipulation, but having occasion to draw up a contract in which it was very necessary to use the utmost precaution, I wrote a similar clause and paid a lawyer for his opinion of its validity, and was surprised to have his answer that the contract in that form would, he thought, be valid against even the party who furnished the materials, or the "material man" as the law calls him, and that thus, without his consent, we could prevent his claiming any satisfaction from the owner after his goods were once delivered at the building, no matter whether they were simply piled up alongside, and if the builder went into bankruptcy, he could only collect his dividend from the assignee.

This stipulation, then, may be of use in some cases; in common practice, however, it has seemed to me that it might be made to commit the owner to accept inferior material if once delivered, and that it was as well to omit it.

It must not be supposed that the lumber dealer is entirely without protection. By the statute, he has a lien on the building itself for the value of his materials, provided he gives notice of his intention to claim such a lien when the materials are delivered, and by giving such notice he can collect the value of his goods from the owner in the same manner as the workmen under mechanics' liens; and it is only when such notice is not given that he can be deprived of his remedy against the owner, as just described.

A little corollary may be drawn from this, that instead of the common clause in printed contracts, that "security against mechanics' liens must be given prior to payment by the party of the first part," the condition should be enlarged to include "mechanics' liens and other claims chargeable to the party of the second part."

It is not every one who knows all that is to be known about mechanics' liens. They are popularly regarded as things to be dreaded, but not provided against, and we are all liable to be entertained by our clients with stories of their friends who through their confidence in their architect had to pay twice over for their house, once to the contractor and again to the workmen through liens. The statute reads that the right to enter a lien for work done extends for thirty days after the work, for which the lien is claimed, is finished, and sharp contractors have been known to keep a man about a building for weeks to extend the time within which their workmen might, by their collusion, record liens against it, and any suspicious proceedings of the kind should be watched and notes made of them, and the record book frequently examined. By the law, the owner can prevent any workman, employed by a contractor, from claiming a lien on his building, simply by serving notice on him when he begins to work that he will not admit such a lien from him. The man may then work or not, but if he chooses to work he can only look to the contractor for his pay. In practice, however, it would not be easy to recognize every new workman when he began his labors, and a subsequent notice would not destroy his claim for a lien for work done previous to the notice.

Perhaps it would be well if architects were more careful to guard the interests of their clients in this respect. Scores of liens are recorded every week in the large cities, and often for large amounts. It is obvious that a good percentage of the amounts due should always be reserved till the final payment, and that this should not be made due till at least thirty-one days after the completion of the work. The "security against a mechanic's lien" of which the contracts speak is so rarely exacted, that I doubt if many architects know in what form such security should be.

Having had occasion to inquire about the subject from a lawyer, I was told that the best form would be a bond with sureties, in a sufficient sum, the condition being, that if no lien were recorded within the time allowed the bond should be void. On inquiry at the Street Commissioner's Office, in Boston, I learned that they required such a bond, but they said that they had a special one drawn up by the city solicitor for each case.

In practice, the simplest way is to keep watch of the record, usually the book of mortgages on real estate, unless a special book for liens is provided, and if no record is found within the allotted time, the building is then free. Sometimes the clerk will give a memorandum with date and signature, to the effect that no liens exist at the given time.

It is often very annoying to go long distances to the town or place where the records of a thinly inhabited district are kept, and then the bond with sureties might be exacted, though most builders would dislike furnishing such documents.

It is well to mention that, by the statute, the laborers who dig ditches or grade the land have also their mechanics' lien upon the land itself, precisely similar to that of the carpenters on the building, and sometimes these men have the strongest propensity for protecting themselves in such a manner.

I once had the misfortune to offend deeply a contractor, whose credit on the mercantile agency books was not very good, so that I proposed to give him a contract on condition that he would find two sureties for its fulfilment. All public contracts are accompanied by such sureties, and if private ones were not sometimes so secured, it seemed not unreasonable that they should be, but he resented the proposition as an unbearable reflection on his character. Perhaps some architects may have had experience which would help in making such a custom more general, and building contracts consequently more secure than they now are, and thereby not only free architects from many of their worst anxieties, but assist owners by increased security, and builders by relieving them of the competition of dishonest and irresponsible contractors.

An interesting point was raised not long ago in the newspapers. A man wanted some painting done on his store front, and to get it as cheap as possible he asked two or three painters to estimate, and accepted one of the estimates. The painter went to work, and while engaged on the building dropped a sign-board or something of the kind and injured a person passing below. The friends of the injured party brought suit against the proprietor of the store for damages, but it turned out that the painter's estimate, and the owner's acceptance of it, formed a valid contract, and that in such a case, the contractor, and not the owner, was liable. If he had employed the painter by the day, the owner would have been principal, and the painter his servant, and it would have been the owner who would have had to pay. This principle is clearly laid down in several reported cases, and is of considerable importance.

It would be interesting to know if an insurance clause was ever inserted in a contract which fully protected all the parties. It is by no means enough for the owner to insure the full value of the building. Suppose the house burns before any payments are made to the contractor: of course the insurance company will not pay anything to the owner, for he has suffered no loss.

The builder may or may not have insured his interest: if he has, all is well, but if not, the loss may very possibly bankrupt him, and the owner thus indirectly suffers by being compelled to make a new contract, or have the assignee do what he can, which is probably not much. It is the desire of providing against the ruin of the builder which leads to the usual provision for insuring jointly, and in case of loss the companies put much difficulty in the way of settlement.

Of course the interest of the two parties in the loss varies constantly. Until a payment is made, the builder's interest goes on increasing up to the amount of the payment. When this is made the interest to that amount is transferred to the owner. No insurance company will undertake to partition the amount of the loss according to the proportionate interest of the parties; they will take premiums from any one, but will only pay the loss to one party. Then, if the builder gets the whole amount, the owner must trust to his honesty to hand him over his portion, and vice versa, which is quite at variance with the proper use of contracts, which are intended to supersede the necessity of confiding in the moral sense of the parties, to say nothing of the possibility of honest differences of opinion. Consequently, careful builders sometimes object to such a clause. In one case the builder could only be satisfied by having the policy written payable to the architects, who were constituted the judges between the parties.

Perhaps the best way would be to specify that the builder should keep his interest insured, and deposit the policy with the architect, who could then make sure of the contractor's interest being protected, and the owner could be trusted to insure his own, and if the builder neglected to take out a policy, the architect would probably have authority to get one in his favor and deduct the premium from his payments.

Even then, however, the builder might claim that his interest required that the owner should keep his part of the risk well covered, and a separate clause might be added to that effect.

Something might well be done to settle this point. It is very common to hear of small builders being ruined by the burning of a house upon which they were engaged, and in such cases the owner must suffer annoyance and loss outside of the risk which he thought he was insured against.

There is one more remark which may be made, about the forfeiture clause, which gives more trouble than any other in most cases. This is usually inserted to enforce the completion of the work on a given day, but a similar stipulation is sometimes made to guard against the workmen driving over the grass, or leaving shavings about, or in other ways interfering with the real or imaginary interests of the owner.

It is very common to have a client thoughtlessly insist upon penalties out of all proportion to the loss inflicted upon him by the failure of the contractor to keep his agreement. Every one has known the man who undertakes, late in the season, to build a two thousand dollar country house for immediate occupancy, and, in his eagerness to insure its being done by the time he wants to live in it, demands that the contract shall include a forfeiture of twenty, fifty, or a hundred dollars a day for every day's delay beyond a certain date, ignorant of the fact that by fixing an unreasonable penalty, he loses the chance of exacting anything in case of default. The law presumes that the forfeiture is intended to be an agreed measure of the actual pecuniary loss which the injured party will suffer in case of the failure of the other party to complete his contract, as, for instance, in the supposed case, the amount of the rent which he would have to pay for another house while he was waiting for his own. It will allow him nothing for the injury to his feelings at being disappointed, or for

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having to postpone visits from his friends, and if the builder can show that the stipulated forfeiture is clearly unreasonable, a court will reduce it to the actual pecuniary damage.

If the owner is careful to make the forfeiture so moderate that it will pay his house-rent during the delay and leave a little over to console his injured feelings, he may hope to keep that by reason of its being too small a matter for the builder to fight about, but if it should be large enough to be worth a struggle, he is pretty sure to lose it.

It is greatly to be wished that more exact systems of contracting, specifying, and estimating work could be brought into common practice. Actions on building contracts are much too frequent, and would be still more so but that the owner, finding that if the decision rests with a jury, the contractor almost invariably wins, regardless of the evidence, makes the best compromise he can, in case of dispute, rather than be brought into court; and of the inadequacy of our common specifications and estimates the enormous differences between the bids of competing builders in the case of every large building, and the long bills of extras at completion, give striking evidence.

It would seem possible for architects, by united action, to establish a kind of official schedule of prices somewhat after the model of those kept in the large cities of France. There, after the schedule of quantities is drawn up, the estimates are often made by the bidders offering each so much percentage of discount from the official price list, the party offering the greatest discount being the successful one. Although this could hardly be done here, the difference between this scientific proceeding and our wild figuring, where the estimates vary two or three hundred per cent, and the lowest bidder is not unlikely, after his contract is signed, to claim that he "forgot to count in the roof," or "added up a column of figures wrong," is sufficiently striking, and the advantage in the case of extra bills, and for the architect's own approximate estimating, is very considerable. With such a table of prices and a number of forms of contract from which the architect could choose one applicable to each particular case, our labors would be much lightened, and their results better secured.

AMERICAN DRAMATIC THEATRES.[1] I.

"Modern theatres, so far, at least, as concerns their internal arrangements, are the only important buildings in modern times designed wholly without reference to precedent, and regarding which an architect really must think what is best to be done and how he can best do it. It hence arises that in speaking of them we must revert to our old principles of criticism, and explain their peculiarities as if they were the works of reasoning men and not the products of copying machines." — *Fergusson's History of Modern Architecture.*

The modern theatre, in its best possible estate, furnishes a form of amusement which attracts and moves alike rich and poor, learned and simple. Fitly spoken words, strengthened and intensified by the carefully studied tones, gestures, and facial expressions of the skilled elocutionist, are more potent in their effect on the soul of the hearer than any other known influence. But when such words are embodied in a noble dramatic work; when to the graces of numerous actors and actresses are added the interest of stirring plot, of tasteful dress heightening the effect of personal beauty, of changing scene and of fitting and stimulating music, there results a form of entertainment unrivalled in attraction and powerful in the community for good or evil. It will be well for the progress of civilization when the influences now feebly and ineffectually opposed to the drama shall be turned in the direction of the support and encouragement of all that is best in it.

To the quick apprehension and keen sense of humor of the American a play becomes for the moment reality, and serves for the time, better than any other form of relaxation, to relieve him from the strain of overwork, and give that rest that can be had by an entire change of thought and interest from ordinary channels better than by mere inaction.

Until within a very few years almost everything that was considered of importance or value in the dramatic world was imported. Theatres were built and managed after European models, mostly borrowed from London or Paris. The presiding mechanical genius, the carpenter or machinist, the "handy man" of the stage, was often the architect of the auditorium; and was sometimes fairly successful in that capacity. In his ordinary work he was forced, by the high cost of labor and the necessity for the cheap and rapid reproduction of the scenic effects of elaborate foreign plays, to exercise his ingenuity in the improvement of the old complicated and somewhat cumbersome machinery. In this he achieved such success that the work done in a London or Parisian theatre by a dozen men is often accomplished here by one half that number. From this forced departure from foreign precedents on the stage, and some peculiarities of auditorium originating in the demands of American audiences for comfort and equality, a certain independent style of theatrical architecture originated, displaying good and bad qualities both distinctively its own, but which, however prominent the errors may have been, kept steadily in view the practical uses of the structure and the rights of the play-going public.

Mr. John Oxenford, in a letter to the *London Times* in 1867, says that the New York theatres are "light, commodious, and so arranged as to allow nearly the whole of the audience a good view of the stage;" qualities which by implication he denies to many at home; although commending the same good points in some late English examples: the Alexandra of Liverpool, by Mr. Salomons, being specially praised.

Mr. Boucicault in his testimony before the British House of Commons Committee, in 1866, says of American theatres, they "are very much more comfortable and larger and better ventilated; they are better in every respect; they have wider entrances," and so on. And again, that "the American theatre is more airy. I suppose they began with a better model." The comparison drawn is with London examples.

Having then started with "a better model," the secret of our future success in the arrangement of these places of amusement must lie in a certain simple and practical treatment of the problems involved, aside from considerations of precedent, and regarding chiefly the most direct methods of adapting means to ends. It may be years before we equal or excel our transatlantic cousins in the art qualities of our dramatic temples; it must be many years before private enterprise will be encouraged to build for profit such elegant and durable structures as those of Paris; but in matters of convenience, comfort, and a reasonable approximation to safety we are less hampered, and may hope for rapid improvement.

It must be borne in mind, then, that the scope of these papers does not embrace such monumental buildings as are erected, supported, and directed by a nation without regard to any money return on their cost. The time has hardly arrived when our government officials can be entrusted with the fostering care and patronage of national opera. The ballot and the ballet can hardly go together as yet.

Though an architect be guilty of many sins against comfort, health, and safety in the department of church building; though he may find a congregation prosperous and leave it swamped in debt, still if he display a certain cleverness in scenic effects, and enterprise and shrewd management in competitions, he may not suffer much pecuniarily; and if his professional conscience be sufficiently hardened he may enjoy a moderately prosperous career. But in the matter of theatre building the parties interested will stand no such *trifling*. The venture must pay as a commercial investment, or the designer is likely to find little further demand for similar services from him. A competition in theatrical design is an especial absurdity, and the projectors of such works, feeling their inability to cope with the problems involved, or to judge of their ultimate success from the intricate drawings required, take what is the only common-sense course in all such matters, and secure the services of the most competent and experienced professional adviser available.

In addition to the business demand of the ordinary amusement-loving public and the managers, there must be considered in the same connection the wants of amateurs. The future Garricks of country town-halls demand better accommodations for the display of their budding talents, and, with their constituents and admirers, are ready to invest, if not in a theatre at least in an "opera-house," music-hall, or "academy of music;" these high-sounding names often indicating a regular theatre, so far as arrangement and design can make one, and usually not of the first class. This amateur element is of no mean importance. It furnishes an intelligent, and in some cases a cultivated, set of recruits to the regular stage. It stimulates an interest in and increases the profits of the theatres; and, by proving to the aspirant that great success in this, as in any other calling, can only be obtained through hard and persistent labor, it leads to greater respect for what is really worthy of admiration, and thus raises the popular standard of excellence. It must be borne in mind, therefore, that the larger number of the halls to be built in the future must be arranged conveniently for dramatic entertainments.

In the early days of American theatrical enterprise, as has been stated, the English system was strictly followed, but the peculiarities of national character soon promoted decided variations from the old types. The regular drama found among the care-laden workers of the new world a powerful rival in the mirth-provoking negro minstrelsy, which in turn gave place to the "variety business," the latter to be followed and surpassed by "extravaganza," "opera bouffe," and "burlesque." To the careful observer of the wants and ways of the people, these phases of entertainment, with all their lights and shadows, both intellectual and moral, indicate a certain progress towards desirable ends; and to-day the theatre is advancing slowly to a hopeful place in American civilization.

In the changes plainly foreshadowed, the railroad and telegraph, combined with a Yankee facility of invention, must have a marked influence on the "show business," so called, and are likely to give a decided and exceptional character to the buildings devoted to such uses.

Another peculiarity of the new condition of things lies in the fact that to a great extent the capitalist or adventurer has supplanted the professional player in the conduct of theatrical ventures. Whether this transfer of the management to the speculator is likely to elevate and improve the actor and his art is most questionable. But the architect has to deal with given conditions, and it is undoubtedly the tendency of our imperfect civilization to encourage the inexpert to take up any new calling that may promise to the fortunate or the unscrupulous a short and easy road to wealth. Thus the carpenter, without special preparation, assumes the name of architect; and where the theatrical manager was once an actor of more or less eminence, he is as likely now to be a tradesman or mechanic.

[1] A paper on the above subject, read by Mr. John A. Fox at the April meeting of the Boston Chapter A. I. A., is the basis of these articles.

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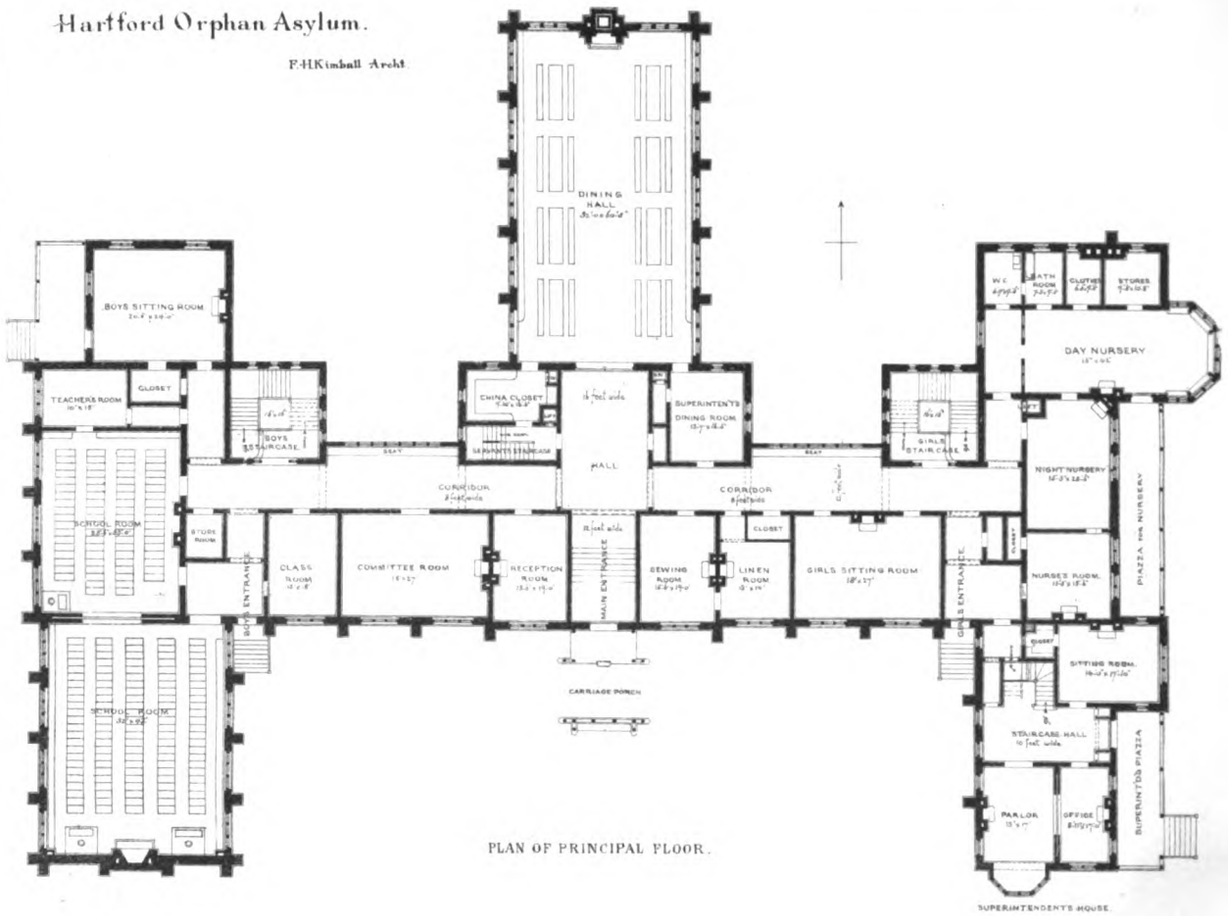
Hartford Orphan Asylum.

F.H.Kimball Archt.



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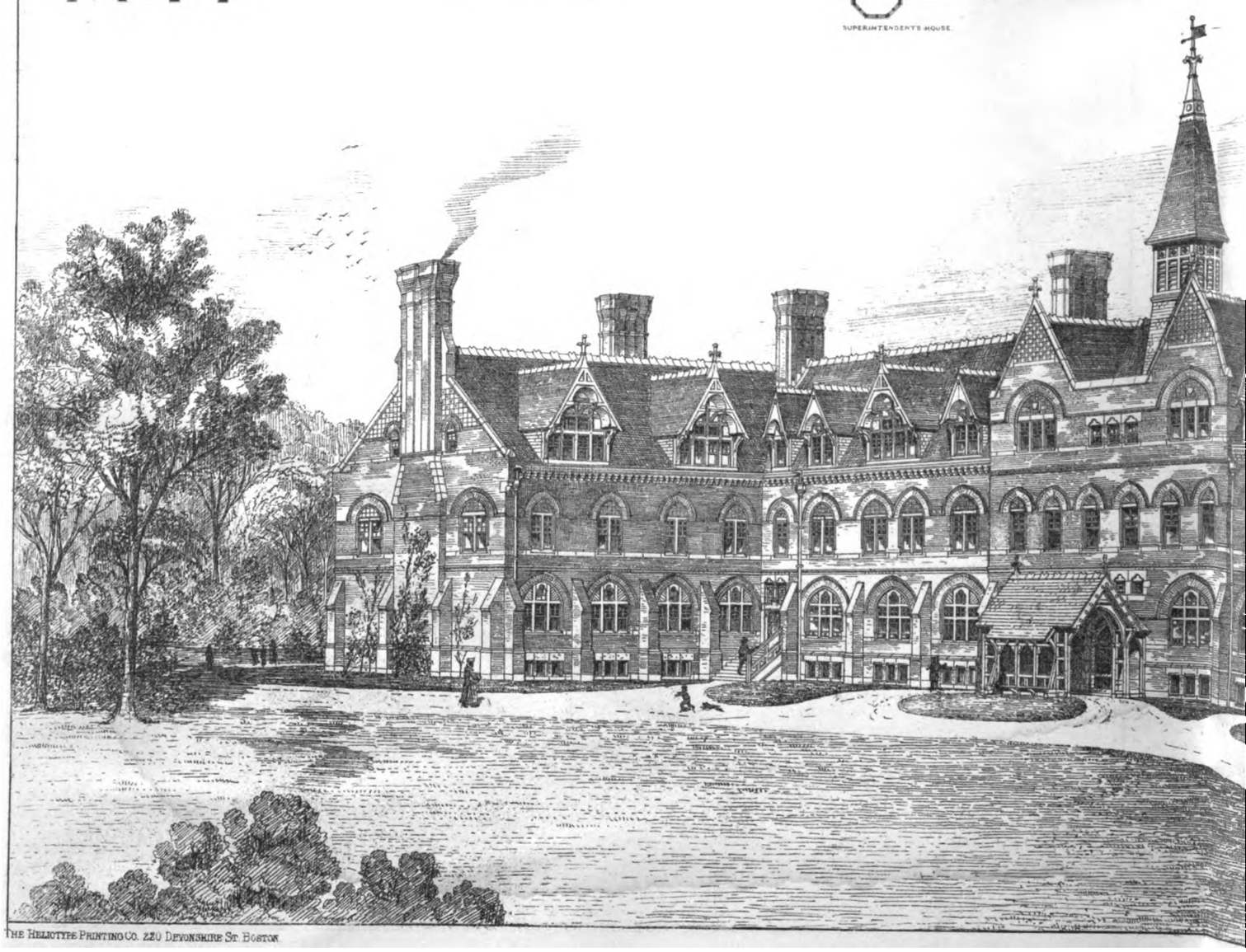

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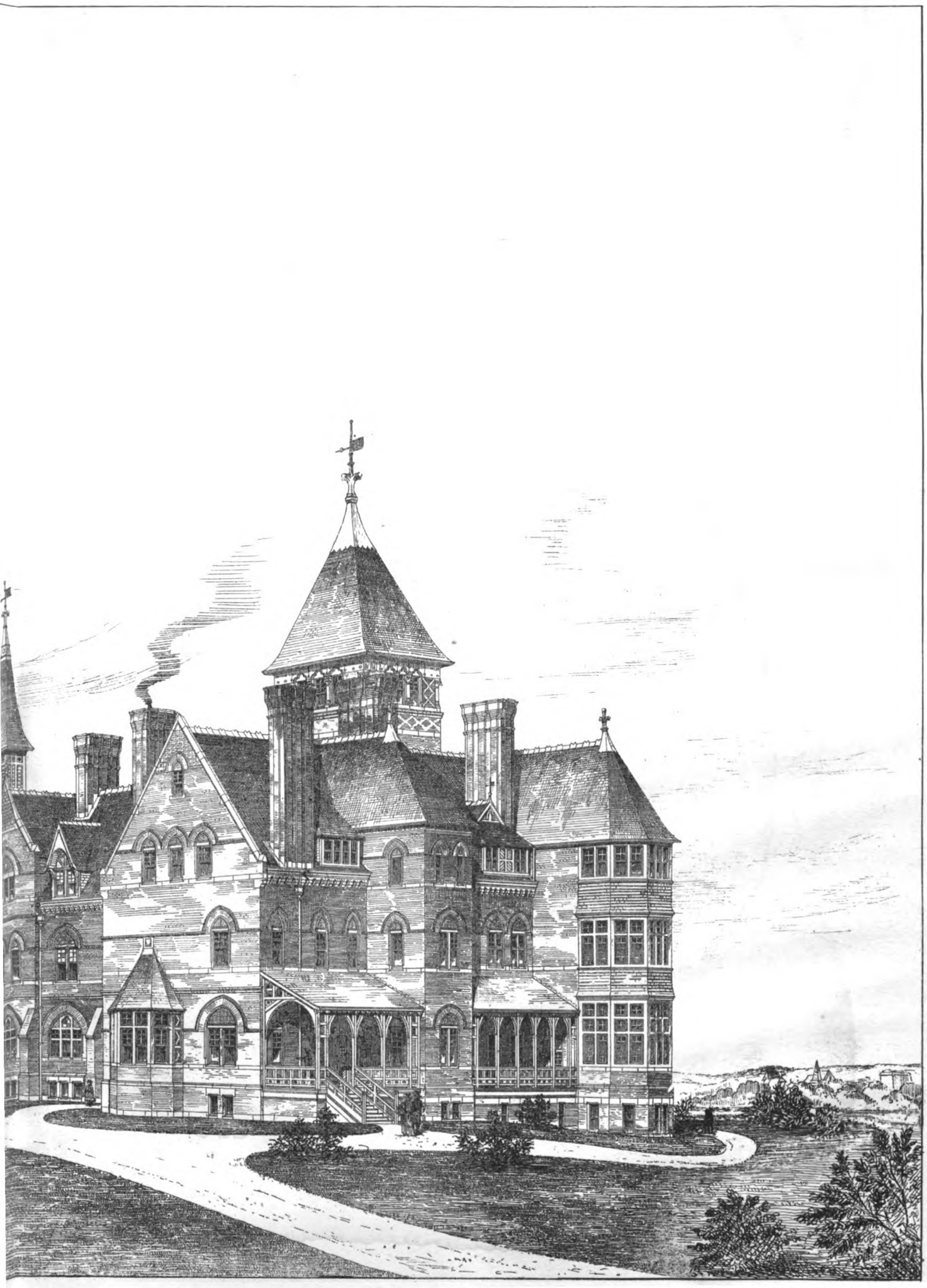

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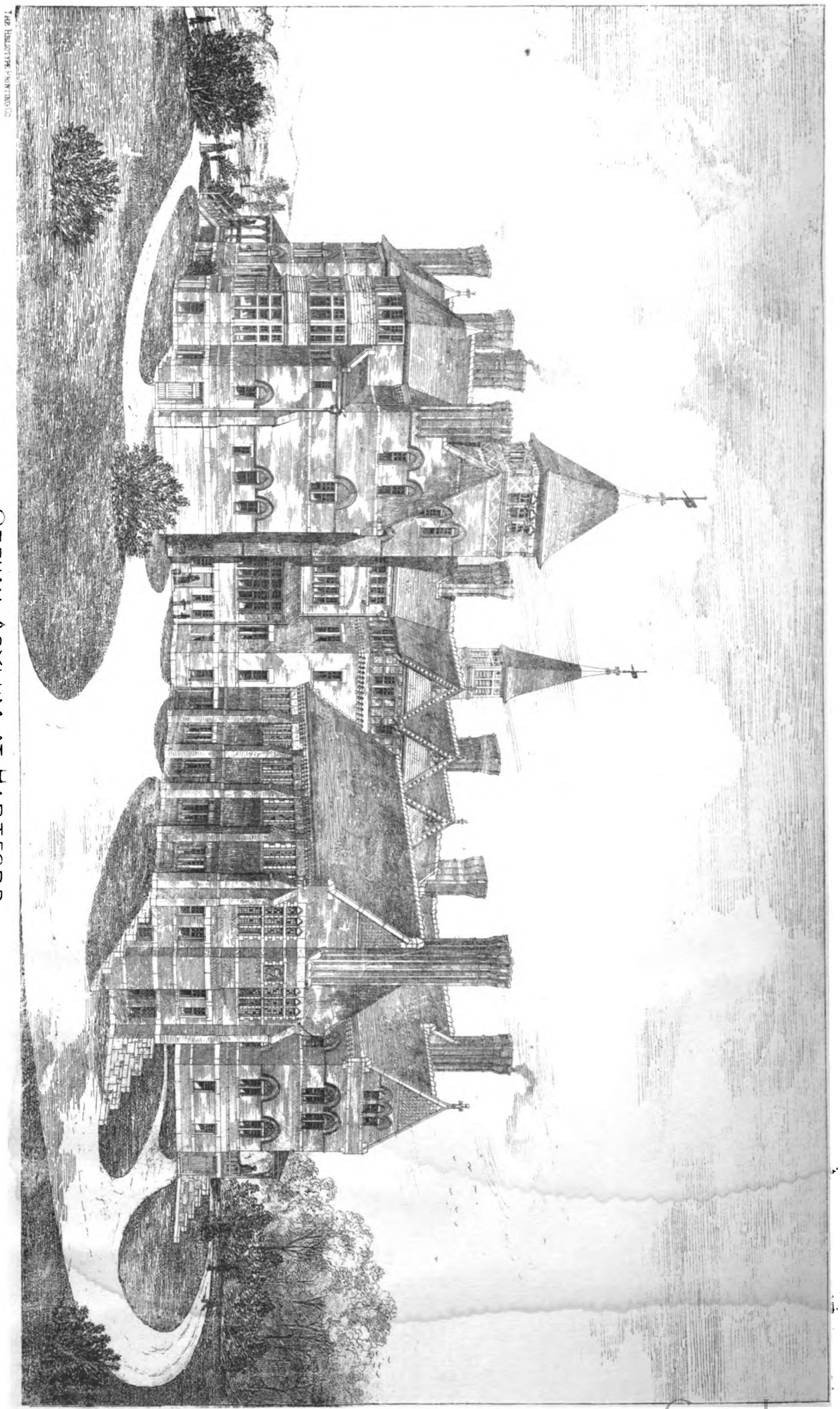

ORPHAN ASYLUM AT HARTFORD

F. H. KIMBALL, ARCHT.

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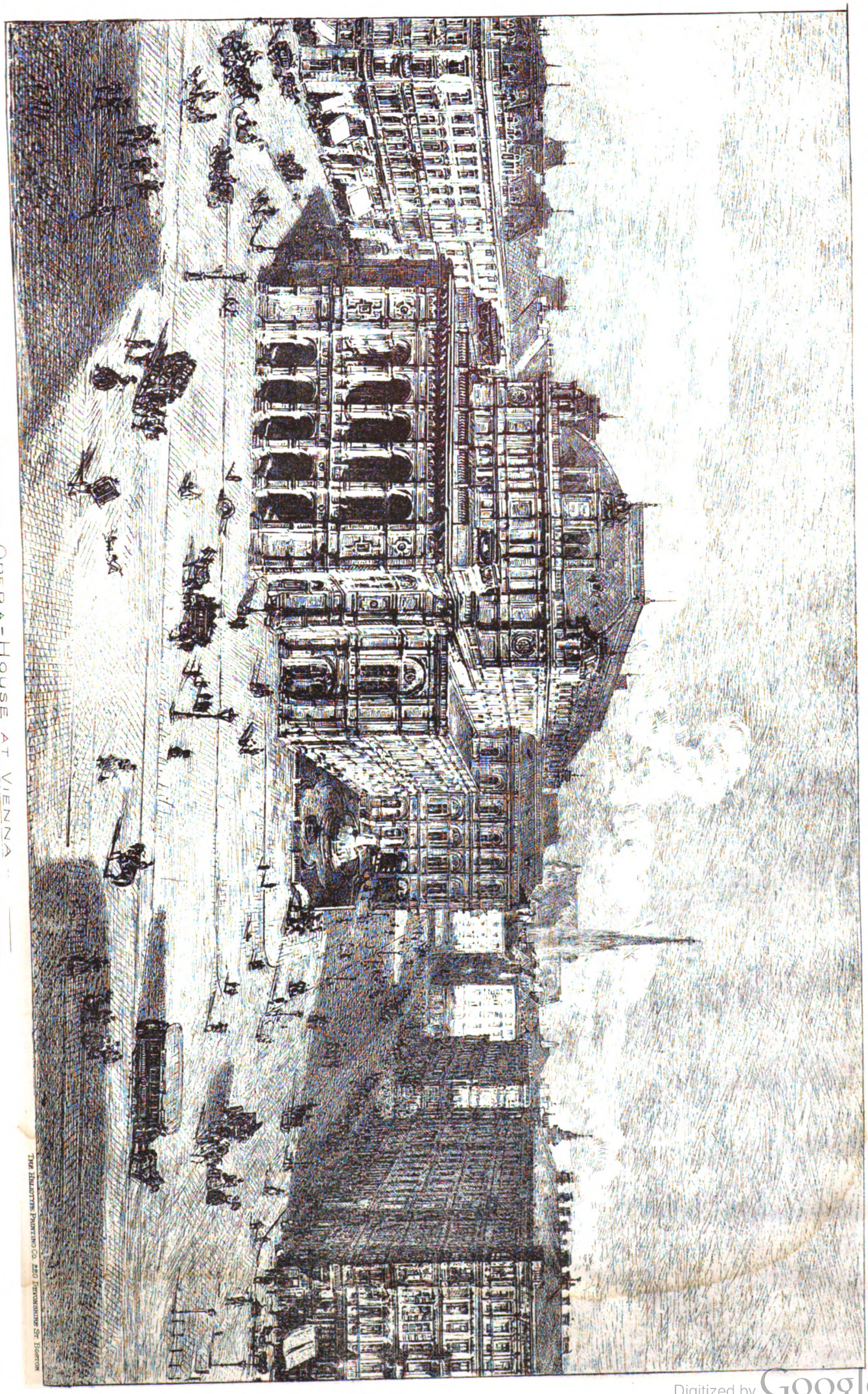

OPERA-HOUSE AT VIENNA

ERECTED AND A VON SICCARDSBURG ARCHTS

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A few years ago our country cousins were obliged to visit Boston or New York if they wished to see a good play well presented. To-day the play, with players, scenery, properties, and orchestra, is furnished at their doors. The "stock company" is almost a thing of the past, *i. e.*, as a local institution, and has given way to travelling "combinations." The actor with his paraphernalia is as common a patron of railroads and hotels as the "drummer" with his sample cases. This change results from natural causes. Only the larger cities can support good dramatic companies, but any railroad town of five thousand inhabitants can, at reasonable expense, build a hall well suited for the uses of such companies; and such a building answers all other requirements of public assembly, except for dancing, and this can easily be provided for in smaller rooms.

The place being provided is speedily availed of and made profitable. A metropolitan manager produces in New York or Boston a new play at great expense, and with actors specially engaged and qualified for their individual roles. On the piece are lavished all the resources of the scene-painter's art, the machinist's invention, and the costumer's skill. An orchestra of the best musicians and new and original music are provided. The venture perhaps fills a profitable season, is thoroughly advertised by posters and lithographs, as well as through the press, and then gives way to a new company and play in turn. But its career does not end here: it is transported by rail to every town that can furnish a hall and an audience; and from Maine to California the most popular dramatic works and actors, formerly confined to the largest cities, become as familiar in the country as the lyceum lecture or the Old Folks' Concert.

Leaving out of consideration then those of the larger theatres, which are better adapted for grand opera, spectacle, and ballet than for comedy, vaudeville, and farce, we find a growing demand for buildings suited to the latter class of works; a class, it may be said, specially adapted to the wants and tastes of Americans. Such buildings must be safe, not too large, comfortable and convenient, and as bright, cheerful, and attractive generally as circumstances will admit. The study of old examples and the experience of the past is of course useful in a degree. But the new problem varies widely from the old; and the architect who uses the past as a reminder of what to avoid, as well as to imitate, and applies himself to meet the new demand in the most straightforward, practical, and independent way, is on the best road to success. J. A. F.

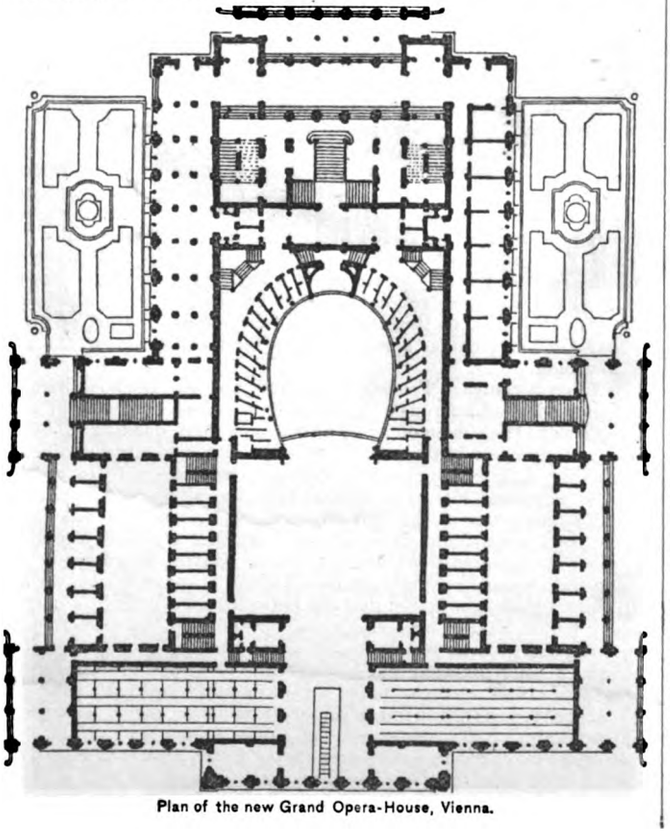
THE ILLUSTRATIONS.

THE HARTFORD ORPHAN ASYLUM, HARTFORD, CONN. MR. F. H. KIMBALL, ARCHITECT, HARTFORD.

A FULL description of this building was published in our issue for November 23, 1878.

THE NEW OPERA-HOUSE AT VIENNA, AUSTRIA. HERREN E. VAN DER NULL AND A. VON SICCARDSBURG, ARCHITECTS.

This reproduction of Herr Rudolf Alt's etching is introduced as a type of the national theatre mentioned in the preceding article, "American Dramatic Theatres."



Plan of the new Grand Opera-House, Vienna.

CORRESPONDENCE.

ANCIENT TROY.

KOUM KALEH, DARDANELLES, June, 1879.

THE mouth of the Scamander at this place is the nearest point of the coast of Asia Minor to the Acropolis of Troy. High hills intervene between the city and Besika Bay at the west, which may be almost as near, and these render this corner of the Dardanelles at all events the most natural seaboard. Here the fleet of the besieging Achæans was probably stationed, dragged up on shore out of the reach of storms, just as are the coasting vessels of the Greeks of to-day, mariners whose nautical customs have, in more than one respect, been handed down unchanged from their ancestors. What Homer tells of a prehistoric voyage might stand for quite an accurate description of going to sea in a modern vessel of Tenedos or Cerigo. The famous Scamander is now but a small stream. It must have greatly diminished since the day when, rising in wrath at blood-stained Achilles, it could completely overflow the plain; a diminution readily accounted for by the destruction of the forests which once clothed its source on Mount Ida and protected its upper course. Koum Kaleh itself contains many a marble fragment, which attests the vicinity of the later Ilion. The work of rounding off architectural members into cannon-balls is still carried on: great heaps of such destructive munition lie in the battered Turkish fortress which is supposed to command the entrance of the strait. Well-curbs and troughs, the quoins and thresholds of the houses, the very mortars in which the primitive villagers ground their wheat and coffee, were once Ionic vases, neatly fluted drums, blocks from every part of the characteristic temple structure of the Greeks. Hissarlik is not a village, has not been since Dr. Schliemann's arrival; he swept away the few miserable huts that were then standing, and Hissarlik is now merely the local name of the eminence which is assumed to have been the Acropolis of ancient Troy, — certainly was of the Greek Ilion. Its truncated cone becomes visible as one passes through the narrow streets of Koum Kaleh. Long files of camels stalking out towards it with nothing will return heavily laden with the produce of the grain fields which cover far and wide the plain of Troy. The rough road crosses the river and its branches several times; the bridges, when of stone at all, are of the finest. The camel grinds a carved fragment of an Ionic cornice beneath his hoofs; he is ill at ease, nevertheless, for he is obliged in this poor country to provide his own saddle, — a square patch of hair being left upon a suitable spot of his back when the unhappy animal is sheared.

Hissarlik is at the end of the plain, a spur of the Mountains of Mysia. It looks from afar as though mining operations were carried on there, the displaced earth of the excavations, which has been shot over the steep side of the hill, making it a conspicuous point in the otherwise green and fertile landscape. It is eight kilometres along the winding path from the sea to its foot, according to a pedometer, though in a direct line it can be no more than seven, — some four miles, — just the distance of the Acropolis of Athens from the Bay of Salamis. Of the two situations that of Troy seems almost the more favored by nature. It stands in the midst of a widespreading and beautiful country, watered by numerous springs and by a river which is still larger than any stream of the Peloponnesus. It is protected from the scorching breath of Arabian deserts by the mountain range of which Mount Ida is so prominent a peak, and is open to cool and steady breezes from the northeast, the prevalent wind of the summer months, which comes from Russian steppes over the Black Sea to seek the more rarified atmosphere of Asia Minor. These broad plains are even to-day a grain magazine for the whole surrounding country, while the hills behind are covered with fruit trees, many of the most familiar being here indigenous: from this small tract were derived our cherry, apricot, and filbert trees, as well as the more humble spinach and asparagus.

The ancient city was sufficiently distant from the port to feel secure from sudden descents of marauding enemies or of pirates, though near enough fully to profit by its commerce. Every vessel passing the Dardanelles, the great high road between the east and the west, is distinctly visible. On clear days, incredible as it may appear, Mount Athos may be seen at a distance of far more than one hundred miles. The view from the citadel of this great garden, uncultivated as much of it now is, is wonderfully beautiful and interesting. Technical disputes as to whether the hill of Hissarlik or that of more remote Bournabashi was the scene of Homer's story cannot greatly concern us; the former is certainly by nature the commanding site of the Troad. To use Dr. Schliemann's words, he has indeed "dug up the whole city." The results of this labor are, in architectural respects, disappointing; it would be beyond my province to discuss the far greater contributions which have been made to archæology and anthropology. Of the first two Troys absolutely nothing has been found that can be spoken of as architecture. These primitive cities were evidently wholly constructed of wood, and a thick stratum of ashes is all that is left of their buildings. The cut stones that have come to light belonged to edifices of the later Greek Ilion, and even of these there are but fragments, nothing that can be presumed of earlier date than the fourth century B. C., while most is much later.

The decadence of Greek architecture is already too well represented in proportion to the few remains which show the character of the developing art, of the styles before they degenerated into for-

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malism. We would willingly spare the ruins of Messem, Thorikor, and Troy for a single stone which could throw additional light upon plan or memberment of the Temple of Assos or of Corinth. Unfortunately, at Troy all is both late and fragmentary. One course of stylobate blocks has been left in position upon the crest of the hill, now almost entirely dug from beneath them, but these give no clue to the size or disposition of the fane. It was alone by the discovery of the plans that similar results of the Samothrace expedition gained sufficient weight to justify their publication. That which has been found here will probably never thus be collected and made known in a monograph, as restorations are impossible.

The oldest fragments are not marble, but are of a coarse tufa-like limestone, similar to the Greek *poros*, which seems everywhere to have preceded the introduction of the finer material, being brought to a smooth surface by a heavy priming of stucco. Arrian relates, that when Alexander the Great visited Ilion, on his way to India, in 334 B. C., he saw there a "tiny" temple. Remains of this are thought to be recognized in some Doric members cut out of the coarser stone, which are indeed on a very diminutive scale. If the supposition be correct, this monument alone is of earlier date than the time of the Diadochii. The only bit of it I could find was a broken triglyph and metope, the forms of which show conclusively, to my mind, that it was not cut before the middle of the fourth century, although the learned gentlemen connected with the excavations had, on account of the rough material, assumed it to be older. The height of the frieze was 0.345 m., less than half that of the Theseus temple. This would correspond, in a structure of late proportions, to a shaft of about three metres, the intercolumniation being merely a door-like passage. M. Burnouf, a scholar well known to architects by his early publication of the Parthenon curvatures, in the *Revue des Deux Mondes*, assured me that other pieces of this curious little temple had been found, a block of the cornice, a much mutilated capital, and several drums; he kindly gave me the measurements which he had taken when they were first unearthed. These stones have been rolled down the chute and were not to be found. This I regret, as M. Burnouf had not observed the number of the rings, or the character of the echinus of the capital, and some of the less important dimensions had escaped his attention. The capital of a Doric temple is as the head of the human figure, most quickly conveying an impression of its nature. The drum had twenty channels, and remained in the polygonal state, the building then not having been entirely completed at the time of Alexander's visit. The diameters varied from 0.54 to 0.6 m. This is not at all an archaic proportion to the frieze or to a cornice projection of 0.18 m.; in fact if the norm had not been late and attenuated it would have been impossible with shafts of such small absolute thickness to have provided the requisite height of passage. The later remains are of a fine-grained and perfectly white marble, a beautiful building material, reported to have been brought from the mountains of the southwestern Troad. Were this the case the transportation of its immense blocks must have been a matter of considerable difficulty. The upper Scamander was always too shallow to support laden boats, too narrow for the passage of rafts. The Greeks did not, I believe, use camels as beasts of burden, and these animals are at present the only means of conveying heavy loads from the interior. In default of any positive information, it may be held more probable that the stone came by sea, perhaps from Thasos, an island which provides this quality of marble, and was always the quarry for this part of the Mediterranean. The remains consist of Doric shafts, — the largest belonging to a temple which must have been nearly the size of the great order of the Athenian Propylæa, a random drum having a diameter of 1.18 m., — of capitals with the straight-lined echinus characteristic of post-Alexandrian work, of Ionic columns, both free and partly engaged, and of numberless caissons, architraves, and wall stones. An uncompleted Doric cornice shows the ancient stone-workers' method of laying out, by a system of outlines, the guttæ, when these were of one block with the mutule. The cutting is as a rule exceedingly good, but all these members have the flat and conventional forms which make them so worthless. Of greater general interest is a sculptured metope, similar to the one previously found, widely known as Apollo and the horses, but this carving is inferior and so much defaced that it is hardly worth transportation. It represents two figures in combat; one, fallen upon one knee, is seized by the advancing adversary. Judged in the present mutilated condition it appears a work of but little artistic merit. Such are the meagre architectural results of the excavations at Hissarlik. There is really almost more of the marble Ilion in the Turkish graveyards of the plain than Dr. Schliemann has unearthed, the better fragments having been carried off, year after year, to do reluctant duty as gravestones. In one of these fields I found the missing capital of the great marble temple, besides several inscriptions on pedestal shafts. My visit happened on the last day of the Doctor's stay at Troy. His work is completed, the season advances, and he goes never to return. His thoughts are directed to Sardis, where there can be little doubt that his untiring labor and immense expenditure will be more richly repaid. The workmen who have here dug up the whole city have long since dispersed; and soon the familiar attendants, Hippodamia, the cook, and Pelops, who serves at table (a name full of ghastly associations in such an office), will leave the scene of their ten years' labor. It has taken just as long to excavate as it once did to besiege Troy. The trenches will remain open, by special permission of the Ottoman government, an advantage, though it may be improbable that further researches will ever be undertaken. The honey-combed Acropolis and the perforated tunnels will at all events long bear witness to the enormous labor expended upon them in the interest of science.

I desire to thank Dr. Schliemann for the politeness and hospitality which he showed to the obscure foot-traveller who passed his door at the most vexatious of all times, — the hour of hurried packing.

DR. SCHLIEMANN'S EXCAVATIONS.

"Here at Troy I have continued the excavations with the utmost energy, but with less success than formerly, having this time found only two treasures of Trojan gold jewelry, and Ilium appears now to be exhausted. Both treasures were found in the presence of Professor Virchow and M. Burnouf. The first treasure was struck at a depth of only 13 feet 4 inches below the surface, on the east side of my excavations, in that part of the ground where a considerable portion of it, 6 feet to 10 feet thick, had evidently been cut away when the temples of Minerva and Apollo were built, because in some places the calcined débris of Troy follow there abruptly below the stratum of Hellenic ruins. The treasure lay on the ruins of a house-wall, which seems to have fallen from an upper story; it consists of three gold disks in the form of flowers, 4½ centimetres in diameter, of embossed work and much like the disk numbered 251 in my 'Mycenæ;' further, a gold head-ornament, '*plekté anadesmé*,' 18 inches long, the upper part of which is in the form of a basket and ornamented with small gold rings, which are soldered on and filled with a substance of white glass. The latter has probably had another color, and may have been blue. From this ornament are suspended ten gold chains, each of which is composed of 155 links, and each link is covered with a gold leaf; consequently, there are 1,550 links and as many leaves on this beautiful head-dress. At the extremity of each chain is suspended a gold idol 3½ centimetres long, with two eyes well indicated. There are, besides, the fragments of seven much larger gold idols. This gold head-dress had, by the inadvertency of the laborer, been thrown with the débris on the wheelbarrow to be thrown away, when, most luckily, it was perceived by the keen eye of Professor Virchow, who saved it for science. The second treasure was found, at a depth of 33 feet 4 inches below the surface, on the slope of the great wall, to the northwest of the gate. The most curious object in this treasure is a silver spoon in the form of a bowl, having in the centre an embossed ornament much resembling a Trojan shield (*aspis omphaloessa;* see the engraving No. 234, Plate 14, in my 'Troy and its Remains'); it has a very long handle, which terminates in a large ring, and which is ornamented with a tree nicely engraved. This spoon is unique in the world; it seems to have served for libations, for it can never have been employed for domestic use. The treasure further contained two gold ear-rings of very large size, each formed of seven serpents; two others, ornamented with rosettes, and four or five chains with idols at the ends; other gold ear-rings without pendants; a gold ring for holding the locks; a gold frontlet; ten gold ornaments, each with four spirals similar to No. 297 in my 'Mycenæ;' two enormous, very heavy gold bracelets, consisting of very thick gold wire, having only at one extremity an ornament in the shape of a flower button; a large quantity of gold beads and rings, six silver ear-rings; a large silver bracelet; and, finally, hundreds of silver rings, which must have been strung on a thread, because all are fused together in long rows. To all this silver jewelry have been fused in the conflagrations numerous gold beads, also one of the gold ornaments like No. 297 in my 'Mycenæ.' Of other curious objects, I may mention a long dagger of silver, the extremity of the handle of which represents a cow with long horns; a rude idol of trachyte, eight inches long; small animals modelled of black clay, such as dogs, cows, rams, lions, etc.; a very curious vase, six inches high, with very large eyes and a perfect owl's head, on which is fixed a small cup or bowl, forming the mouth-piece; it has around the neck a fourfold necklace, it has two breasts, and the arms run out into two handles, between which, precisely in the place of the navel, is a nicely-shaped funnel or spout. I may further mention a rattle-box of terra-cotta, having the form of a woman.

"What astonishes Professor Virchow and M. Burnouf here are not so much the hundreds of house-walls which have been built in all directions in the course of ages, as the monstrous quantity of bricks, which solely occur in the burnt city — the city suddenly destroyed by a fearful calamity, the city in which ten treasuries were found; and this is the second city in succession from the virgin soil. Although the different layers of the first city compose a mass of débris 23 feet deep, yet I never found there a brick. Neither are there any bricks in the two uppermost pre-historic cities. Having in company with these friends most carefully examined many heaps of bricks, we have all three become convinced that the latter have been slightly burnt in ovens before having been employed for building, because they are too uniformly burnt to admit that their burning should have been produced solely by the great conflagration; besides, even in compact masses of bricks we never found a raw, merely sun-dried brick. We have, besides, never found a single brick in its place, because the substructures of the houses were of stones joined for the most part with pure clay, but in a very great many cases, also, either with clay mixed with weeds and prepared for brick-making, or with a cement of crushed bricks, whereas all the upper stories were of bricks, and

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were held together by their floors of beams, covered with a layer of clay to make them smooth, for the prehistoric man had no saws or other instruments to make planks, and least of all the Trojan. Trees cannot be cloven to planks with stone axes such as we find here, for their wood forms a sort of helix. Besides, we have in the pre-historic houses brought to light at Thera (Santorin), below three strata upwards of 66 feet deep of pumice-stone and volcanic ashes, the most certain proofs that the floors consisted of beams, and not of planks. Now, by the white heat engendered by the burning of the many floors of beams, all the bricks fell together in confused masses, and, by the silica they contained, they became in many places even partly vitrified. The ligament with which the bricks were joined consists of clay mixed with weeds, and Virchow and Burnouf think that this clay is nothing but a sort of cement made of crushed bricks mixed with water. In several places we find even Trojan house-walls of stones built on heaps of débris of such slightly burnt bricks, and this would point to partial fires long before the great conflagration. The skill the prehistoric peoples here had acquired in consolidating the loose ashes and débris by interposing portions of liquid clay is really astonishing. In fact, this strange process of rendering ashes hard like stone has been in practice here by the inhabitants of all the four prehistoric cities from the virgin soil to the uppermost layer. I still call visitors' particular attention to the Trojan street, 4 feet 9 inches broad, paved with large flags which bear the marks of the white heat to which they have been exposed. This street may be seen just above the ruins of the first city on the east side of my great trench."

CHAPEL ARCHITECTS.

FIRST, a committee is appointed, chiefly of men wholly unacquainted with the work before them. Contributions come in well. The power of the voluntary principle is illustrated. The committee meet and talk over what is before them. There is no disagreement as to what they require, but very little agreement as to how it can be secured. Deacon A., who has never done such a thing before, sketches a plan in pencil. It is an oblong building, fifteen feet by forty-five feet; he thinks it would seat about nine hundred on the ground floor, and that side galleries could afterwards be added. Brother B. has sat up all night with some red and black paint, and produces a cruciform building like a cathedral, with two rows of piers shutting out the view of the pulpit from numbers; he altogether overlooks the need of a porch, and places the school-room under the chapel, making no provision whatever for lighting it. Another member gets his daughter to draw out a sketch of a Wesleyan village chapel, very pretty, but with the windows overlooking a neighbor's ground, all of which would be blocked up at once. The committee discuss and discuss with considerable development of patience and temper. At length a neighboring gentleman sends a promise of £10, and strongly recommends a friend of his own, who, he says, is a rising and gifted architect, and would undertake the work for half the regular fees. The architect sends for inspection a number of pictures he has drawn, and, being tolerably clever at water-color drawing, they look well. He is invited to meet the committee. "What kind of a building do you need?" he asks. Says Deacon A., "We want a good, substantial building, with none of what I call frippery; no useless ornamentation, no foolish pinnacles and what not; but a plain, handsome place, that shall be an ornament to the town." "Exactly so," all the others respond. The architect, if feeble in skill, is shrewd enough to measure the meaning. He sees they know nothing about it. For whoever wanted a building that was not good — that was not substantial? Whoever wished for frippery and foolish ornaments? Who would not be delighted to secure a place that should be plain and handsome, cheap, and yet an ornament to the town? So the architect engaged them for half an hour in technical expressions. Very soon they were all out of their depth and overwhelmed with his learning and genius, and he left them promising a design on approval. Within a week the design came. Purposely it had some very obvious defects. The pulpit six feet two high, and the vestry door very awkwardly placed. The committee were dazzled with the first sight of the well-painted picture. Deacon A. suggested that the pulpit should be lower. Another thought the entrance to the vestry could be altered with advantage. The architect flattered them on their penetration, altered the design, cut off some two pinnacles (which he had never intended to keep on the plan), said that those alterations would diminish the expense by some £500, and the design was accepted and signed. The contract was taken by a builder who saw at once what was to be done. He knew well the measurements would never do; the strength was all in the wrong places. As he went on with the work this became evident enough; had he completed it the roof would assuredly have fallen in. From the time this became apparent, the architect and builder understood one another, and pulled through pleasantly together somehow. The result was a well-built place without any frippery, and most people were satisfied. The porch was Saxon; the side windows were Early English; on the south, opposite to the pulpit, was an immense perpendicular window, summarily to bring the sermon to an end by blinding the preacher at noonday; the vestry was Tudor, and the gallery was supported by Doric columns; an Italian lantern crowned the whole. As for draughts and acoustic arrangements — well, they were trifles left to take their chance. It was a fact that a noble place, in pure style, could have been built for the same sum of money. Principles of comfort and hearing might have, without extra cost, formed part of the plan. But nothing was contributed to the knowledge or increase of taste in chapel architecture. — *The Freeman.*

GAUGED MORTAR AND IRON.

BOSTON, July 12, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — In a letter to E. A., printed in to-day's *American Architect*, Mr. C. H. Waters, Vice-President of the Clinton Wire Cloth Company, couples with the opinion of C. in relation to the corrosion of wires, when used as lathing, the following words uttered by me in an address delivered at Syracuse on the 20th of last May: "It is also liable to decay through the action of sulphate of lime in gauged mortar." He then proceeds to demonstrate that gauged mortar does not corrode iron wires, calling it a reply to both of us.

If Mr. Waters had read my address more carefully he would have seen that my remark applied to sheet-metal used for lathing, and not to wires. Had he read further on, where I compared sheet-metal with wires when used for this purpose, to the prejudice of the former, he would have found these words: "Wires are less destructible than sheet-iron, because it is necessary to use wires having more body of metal in them than in the sheet-iron that would be used for lath." Also, "One advantage of wire lathing over any other is, that any desired amount of mortar may be forced through the meshes and above the wires."

I may add also that I advised plastering on solid bodies, such as porous tiles, of concrete or clay, in preference to any kind of lathing. Respectfully yours, P. B. WIGHT.

THE NEW BRUNSWICK LEGISLATIVE BUILDINGS COMPETITION.

ST. JOHN, July 7, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — The designs for the above were sent in on the first of February of this year, and I understand lay untouched until the Parliament met, about a month later. They were on view during the time the Parliament was sitting, and now some months have elapsed since the House rose, but as yet no decision has been announced. A few days since one of the competitors complained in a St. John newspaper of the delay.

I am not sure if any competitors have reason to complain, for, although the committee said three prizes would be given for the best designs, they did not say *when*.

How do you generally manage these things in the States? Suppose, for instance, designs were asked and premiums offered for a new town-hall in Boston, and after half a year had elapsed without any decision, would the competing architects complain? I should be glad to have your opinion, or that of your readers, on the subject.

I am, yours, etc., NEW BRUNSWICKER.

[We have no doubt that the architects would complain, but we do not see that they could do anything more, — except to withdraw their plans when they grew tired of waiting. Such delays in competitions are not unknown among us, though fortunately they are not very common. — EDS.]

PUBLICATIONS RECEIVED.

RURAL HYGIENE, by Charles F. Wingate, editor of the *Plumber and Sanitary Engineer*. A paper read at a meeting of the Citizens' Health Association of the Oranges, Bloomfield and Montclair, on the evening of May 1, 1879. Sanitary Tract No. 1.

FOUNDATIONS AND FOUNDATION WALLS for all Classes of Buildings, Pile-Driving, Building Stones and Bricks, Pier and Wall Construction, Mortars, Limes, Cements, Concretes, Stuccos, etc. Sixty Illustrations. Practical Explanations of the Various Methods of Building Foundation Walls for all Kinds of Buildings; Tables of the Weight of Materials, etc. The Kinds of Materials Used, the Loads Sustained, and the Sizes of the Wall-Piers, etc. Use of Piles in Foundations, with Terms, etc. Plastering, Mortars, Limes and Cements; Extracts from New York Building Laws, with Notes. By George T. Powell, Architect and Civil Engineer, New York. To which is added a Treatise on Foundations, with Practical Illustrations of the Method of Isolated Piers as followed in Chicago. By Frederick Baumann, Architect. Revised by G. T. Powell. New York: Bicknell & Comstock, Publishers. 1879.

NOTES OF EXPERIENCE AND INEXPERIENCE.

27. AUTOGENIC SOLDERING. — What is the process of autogenic soldering which is not described in Part III. of "Notes on Building Construction," lately reviewed in this paper? PLUMBER.

28. INSURANCE AND LIGHTNING-RODS. — Do the fire insurance companies grant better rates to buildings which are provided with lightning-conductors than to those unprotected? When examining a building before taking a risk on it do they test the lightning-conductors? What method of applying lightning-rods has their experience taught them to be the best? W.

29. DRY-ROT. — Does dry-rot ever cause spontaneous combustion? Does the mortar used for deafening floors usually cause dry-rot? If it do s, does it attack both upper and under floorings or only one of them? O.

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NOTES AND CLIPPINGS.

Honorary Member of the French Institute. — Mr. D. Ewart, architect in the Department of Public Works at Ottawa, Ont., has been appointed a life member of the French Academy of Architecture for services rendered in connection with the Paris Exhibition.

The Dome of the Hartford Capitol. — It has been decided at length that the covering of the dome of the new capitol shall be gilded after the manner of the State House at Boston. The other alternative was to treat the copper roofing chemically so as to cover it with an uniform coating of verdigris. The cost of the gilding will be about two thousand dollars.

Dressing Stone by Electricity. — Among the novel applications of electricity to the industrial arts is a new stone-dressing apparatus, which is worked by a dynamo-electric machine, and which the inventor claims will dress mill-stones or other stones, and drill rock, economically, with rapidity, precision, and despatch. The chisel employed is fastened to a spring arm which protrudes from a case containing magnets and armatures. This spring arm, when the magnets are connected with the dynamo-electric machine, moves up and down with extreme rapidity, causing the chisel to strike a blow at each descent. The inventor states that it can be made to strike from one to two thousand blows per minute. Wires being used in place of steam-pipes enable the apparatus to be moved readily to any angle, or worked at any reasonable distance without much loss of power; while not the least meritorious portion of the whole invention is the horizontal frame or base to which the electric apparatus is fixed. This frame is portable, and by the use of screws can be so adjusted as to cause the chisel to strike any portion of a circle with either a swift or a slow motion, the number and intensity of the blows being regulated according to the softness or hardness of the stone. By the use of this machine it is said that a mill-stone can be covered in a very short space of time with the necessary grooves and furrows, having the straightness, regularity, and parallelism so much desired in good mill-stone dressing. The apparatus can be worked either automatically or by hand, so as to suit the varying natures of the stone operated upon. — *New York Tribune.*

The Polytechnic Institute, Hanover. — The most costly school-building in the world is probably the new Polytechnic Institute in Hanover. The late King of Hanover commenced the construction of a magnificent palace, upon which he expended about $5,000,000. When his government was overthrown and the kingdom of Hanover became a province of Prussia, the building was found in a half-finished condition. For several years the windows were boarded up, and the empty rooms became the residence of bats and birds. At last the German Government resolved to alter the building and adapt it to the uses of the Polytechnic Institute. The work has been going forward for several years, and is now nearly ended.

The École des Beaux-Arts. — The École des Beaux-Arts, Paris, is to be enlarged, the sites of two houses facing on the Rue Bonaparte having been acquired. In the building erected on their site there will be one hundred and twenty-eight lodges for the competitions, three studios for painting, three for sculpture, three for architecture, one for decoration, and a room for instruction in ornamental drawing. In the basement will be the store-rooms and the modelling studios.

Testing Iron and Steel by Electro-Magnetism. — Two interesting practical applications of electro-magnetism have recently appeared. In one it is applied to discovering flaws in iron or steel; in the other, to measuring the hardness of steel. The theory of the former process (proposed by Mr. Herring, an American mining engineer) is this: When an iron or steel bar is passed through a coil, which is traversed by an electric current, the bar becomes a magnet. If the metal be homogeneous, the polarity of the bar may be inferred from known laws of electro-magnetism. If, however, there be a want of continuity of fibre at some point, *i. e.*, a flaw, new poles are formed there, which a properly mounted needle will readily detect, also giving a measure of the extent of the imperfection causing these false poles. The apparatus is so contrived, then, that the wire or rod to be tested is passed horizontally first through a magnetizing helix, then through a hole in a block of wood, which supports a nicely balanced dipping-needle as magnetometer. The apparatus is, of course, adapted to the size, weight, and shape of the piece to be examined. In testing plates the helix is flattened, and a number of magnetometers are mounted at short intervals on a bar, which can be moved to and fro in front of the helix, and fixed at any desired distance from it. The new apparatus of Professor Wattenhofen, of Prague, for measuring the hardness of steel electro-magnetically, is a development into more practical form of a former idea of his. Its principle is that hardness of steel may be very correctly inferred from a numerical determination of its coercitive force. In its main features, his arrangement is as follows: From one end of a balance arm are suspended successively, in a brass holder, bars of the steels to be examined (these being as nearly as possible equal in weight). The other arm bends obliquely downwards, and bears a constant weight. Motion of the beam causes a pointer to move radially over a scale, the movement being magnified by toothed wheels. One of the steel bars having been suspended, a magnetizing coil, equal to it in length, is raised on a stand so as to inclose the bar, and is fixed with a binding screw when it does. Then a current is sent through the coil; next the coil is released and moved gradually down, pulling the bar with it, till the latter breaks away, and the deflection of the pointer at which this occurs is noted. This affords an estimate of the hardness of the steel. For example, a bar A gives a *maximum* attraction, 9–6; a second bar, B, 15–5; a third, C, 14–6. It is inferred that A is considerably harder than B and C, and of the two latter C is harder than B. Precautions are taken in the apparatus to prevent injury to the parts from the sudden recoil when the hold of the coil on the bar ceases. — *London Times.*

Stone Spider. — It is said that the tomb of Napoleon Bonaparte, at the Hôtel des Invalides, is being eaten away by that which French naturalists describe as a species of stone spider, an insect of which, we fancy, most architects have never heard.

Book Sale in Paris. — At the recent Firmin Didot sale in Paris, 633,000 francs ($126,600) were realized from the five days' sale. The remaining portion of the collection, being the fourth, is expected next May to bring the result up to 5,000,000 francs ($1,000,000). Among the remarkable lots recently sold were Queen Catherine's (wife of Henry V.) missal, which brought $15,200; the "Manuscrit de Bure," $5,600; "a missal for the use of Mont-Cassin," $1,400; a first edition of a work of G. Derandus, $1,300, bought for Berlin; a missal for the use of the Hieronymites of Spain, $460, bought for London; a very rare copy of a work printed at Augsburg, $600; and a "Grande danse macabre des hommes," $1,045. A manuscript which belonged to Mary Queen of Scots brought $2,000.

Arsenic in Water-Colors. — Dr. H. Fleck, in the *Chemiker Zeitung*, calls attention to the danger attending a common draughtsman's trick by the sudden death of a mechanical draughtsman. On a *post-mortem* examination the cause of death was first supposed to be oxalate, and then a narcotic poison. Chemical investigation showed that the liver, kidneys, lungs, heart, and brain were impregnated with arsenic, though the œsophagus contained not a trace, and the stomach with its contents gave a barely perceptible arsenical mirror. The general circumstances of the case excluding the suspicions of suicide and malicious poisoning, it was found that the deceased had been in the habit, when drawing, of placing the pencil filled with color between his lips in order to point it. The water colors he had used were analyzed, and while Indian ink, gamboge, carmine, blue, red eosin ink, and neutral tint were found perfectly free from arsenic, a sample of sepia contained 3.08 per cent of arsenious acid, terra di Sienna 3.14, and a reddish brown color, the name of which was indistinct, 3.15. Burnt sienna, Vandyck brown, bister, bladder green, brown ocher, Indian red, umber, raw and burnt, were also found arseniferous. Most of these colors are essentially iron lakes. Hence it appears that the mere presence of ferric oxide, except in a hydrated state and accompanied by free magnesia in quantity sufficient to neutralize the acids of the stomach, does not act as an antidote to arsenious acid. This case seems likewise to prove that arsenic taken in minute doses can accumulate in the system until it can be readily recognized in all organs, and can exert a dangerous action.

Colored Pencils. — Herr L. von Faber makes pencils for writing upon glass, porcelain, metal, etc., as follows, — Black: ten parts of lamp-black, forty parts white wax, ten parts tallow. White: forty parts white lead, twenty parts wax, ten parts tallow. Blue: ten parts Berlin blue, twenty parts wax, ten parts tallow. Dark blue: fifteen parts Berlin blue, five parts gum arabic, ten parts tallow. Yellow: ten parts chrome yellow, twenty parts wax, ten parts tallow. — *Dingler's Journal.*

How to make Plaster of Paris hard enough for Turning. — Mix with fresh plaster of Paris from two to four per cent of powdered marsh mallow root, then add sufficient water until it forms a mass. This will set in about an hour and become so hard and dry that it may be sawed and turned. It is used in the manufacture of dominoes, dice, etc. When eight per cent of the root is added a still harder mass is obtained, which may be rolled into leaves and painted or varnished. A small quantity of alum added makes it set harder and quicker. — *Canadian Mechanics' Magazine.*

A New Bronzing Process. — A new process for the "bronzing" of iron and porcelain, and which can be indefinitely applied in decorative art, has been perfected by Professor Bottger, a German chemist. Its efficiency depends upon the use of an improved solution for causing the bronze or other colored powder to adhere to the article to be bronzed. It is a concentrated solution of soluble glass, prepared with potash, or a silicate of potash. The article to be decorated is first coated with a thin film or layer of the solution of soluble glass, and the bronze or other powder is applied through a sieve or other means; the articles are then dried by exposure to the atmosphere or artificial heat, after which the excess of powder is removed by a brush. The bronze or other powder so applied will resist the effects of heat and of washing with alcohol, or of polishing by steel or agate burnishers. The invention is particularly adapted for decorating iron and porcelain stoves, inasmuch as the powder will not be affected by heat. The gilding on the frames of pictures and looking-glasses when worn can also be restored by this process.

Hydraulic Tubing. — G. Parravicini recommends a more general substitution of terra-cotta and cement tubes for those of brick and stone, in sewers, water-ways, and other similar underground structures. Among the advantages which he enumerates are: (1) Reduced cost of foundations; (2) ease of building in running water; (3) saving of time in construction; (4) possibility of carrying on the work in winter and at other times when labor is cheap. — *Il Politecnico.*

Artificial Lithographic Stone. — A. Regel, of Gotha, has found that artificial plates of Portland cement may be used with advantage in lithography as a substitute for the costly Sohrhofen stone. — *Dingler's Journal.*

A New Danger-Signal. — A French engineer has devised an instrument for stopping trains in foggy weather, without any chance of failure. The instrument consists of a metal-faced disc rising out of the permanent way between the lines of rail, and placed so that any engine going along the line must brush against it in passing. The engine is provided with a brush for this purpose, made of iron wires, which has an electric communication with the handle of the whistle. In order to bring the train to a standstill it is only necessary for the train, in passing, to come in contact with the disc, and give itself its own danger-signal.

The St. Gothard Tunnel. — It is expected that the St. Gothard Tunnel will be completed by the end of November. The point now reached on the Airolo side is 1,281 metres, that on the Goeschenen side 649 metres from the centre of the mountain; and it is expected that the junction of the two galleries will be made some 300 metres from the centre on its southern side.

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A FORCE of workmen from the Leighton Bridge Works, of Rochester, was on the afternoon of the 19th inst. engaged in erecting the iron roof-trusses of the great round-house of the New York, Lake Erie, and Western Railroad Company at Buffalo, when, for some cause as yet unassigned, the portion already in place fell, mortally injuring several men, and inflicting painful bruises and contusions upon many others. The building is intended to accommodate forty-four engines, and must have been large. One section of the roof was already in place, and another was nearly completed, when the accident occurred. There are various suggestions made as to the cause, but we shall await the verdict of the coroner's jury with interest. If, as seems probable, there was carelessness in the arrangement of the temporary shoring and braces required in the process of placing the trusses, or if, as is not unfrequently the case, the trusses were in this process exposed to strains which were not provided for in the permanent construction, and not sufficiently guarded against by temporary contrivances, and so failed in an unfortunate moment, it is to be hoped that the verdict will clearly set the matter forth, so that the case may serve as a timely warning. The raising and placing of a complicated roof-truss is not a matter to be left to riggers and to handy foremen merely.

THE final opening of the Mississippi to the commerce of the world, as declared in the reports from Washington, seems to be an event of first-rate importance both from a commercial and from an engineering point of view. Captain Eads, by obstructing the flow of water through the secondary mouths of the river so as to give greater volume to that passing through the South Pass, and by sinking his mattresses in two parallel jetties three miles long towards deep water on either side of this pass, has changed the depth of this mouth from six feet to thirty, and thus the maximum channel required by the Jetty Act is said to have been secured. It is to be observed that the act would not allow the engineer to operate on South-West Pass, through which flowed by far the greatest volume of water, fearing to expose the only ship channel, insufficient as it was, to injury by what was regarded as an experiment of engineering. This difficult feat has been accomplished in the face of innumerable obstacles, and with no encouragement from the best engineers in the army and in civil life; and even if, as is claimed by some of them, the deepening of the channel is not permanent on account of the facility with which the detritus washed down by the currents of the great river accumulates in bars at the outlets, sooner or later rendering necessary costly extensions and repairs of the jetty system, or the continued maintenance of an expensive system of dredging, — even if his operations have not secured lasting results, he has indicated a practical way of making the great river scour out its own channels. Moreover, it is said in New Orleans that the saving on freight in cotton, which can now be sent abroad directly from its wharves in heavy ships, without transshipment, is sufficient to pay the entire cost of the jetty work in a single year. We have referred to this interesting undertaking in these columns from time to time, and now that the immediate result aimed at seems to have been successfully achieved, and the lower Mississippi opened to the commerce of the world, mainly by the courage, skill, and persistent effort of one man, the undertaking must, on the whole, take rank with the most important engineering efforts of the century.

IN the discussion on the question of the construction of libraries which took place at the late National Convention of Librarians in Boston, there was exhibited the same tendency to undervalue the services of architects that we are accustomed to see among mill owners, railroad directors, real estate speculators, and in short among all those classes of men who demand in their building operations the most economical and most direct adaptation of means to ends. In fact, a line seems to be sharply drawn between fitness and beauty; on the one side of this line the services of the engineer or builder alone are in demand; on the other the architect has won for himself what may be considered as a due consideration; so that the same gentlemen who deny the fitness of architects to build their factories, their grain-elevators, their storehouses, and their speculative blocks, will readily recognize the value of such professional assistance in the construction, and possibly in the decoration, of their own dwellings, or when serving upon building committees for churches or town-halls. This prejudice found fair expression in the discussion to which we have alluded, when one librarian of eminence gave utterance to a remark which apparently found acceptance among most of his brethren, that in building the ideal library it is necessary to forget all that architects have hitherto done for them, and to begin anew upon what he called a practical basis, without any embarrassments from the traditions of architectural practice; as if ideas of beauty and style, which seemed to be considered the whole stock in trade of architecture, could only be expressed at the expense of some practical requirement of convenience and necessity. The ideal structures proposed at the meeting to fulfil these practical requirements were simply impossible and extravagant, as might have been expected, — productions of Wonderful Lamps, — but the sound common sense and the valuable fruits of experience, which were their inspiration, were of course under proper treatment capable of expression in buildings which would have economy, fitness, and the beauty which comes of fitness, — buildings which would be works of architecture as well as works of convenience. Doubtless architects themselves are in part responsible for this vital misunderstanding regarding their functions; but the difficulty mainly lies in the public, who have not been taught that beauty and perfect fitness are to a great extent synonymous terms, and that the former is the natural outgrowth or flowering of necessity, and is never at variance with it. An engineer, however, — nay, even Professor Huxley's practical bricklayer, — may produce a work of fitness, a work admirably suited to fulfil every essential requirement, but without any expression of beauty. It is the business of the architect to obtain this expression of beauty without any unnecessary sacrifice of the fitness and economy which are the fundamental basis of all sound building. If this result is not often attained by the profession, it is because there are architects and architects, just as there are doctors and doctors, among whom, by the bye, obvious interests have taught the public to exercise a discriminating choice.

WE regret to have to record the death on the 16th inst. of Mr. Henry T. Brush, architect, of Detroit, and a representative of the most conscientious professional thought in the West. He had a good practice and was responsible for some of the best work in his neighborhood. While in this city a year ago he gave evidence of ardent aspirations towards the establishment of a higher grade of professional practice in the West, and with many expressions of regret as to what he modestly conceived to be the limits of his own attainments, he exhibited an unusual degree of sensitiveness as to some high artistic ideal which seemed to be beyond his reach, but which, as a student still in the midst of a remunerative practice, he aimed to realize in his future work. He came eastward, he said, the better to equip himself by observation for an improved career, and to obtain advice as to studies in architectural æsthetics. It may be that, though from a business point of view he was a successful practitioner, he became morbid and discouraged at some real or fancied inability

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to give adequate expression to these aspirations, and this, combined with physical causes perhaps, as he was an invalid, was sufficient to prompt him with curious deliberation to solve the complication by a most deplorable act of suicide. As yet his neighbors and friends have been able to assign no distinct cause for it. He left a wife and two children.

London bridge is fifty-three feet eight inches wide, and allows four lines of vehicular traffic, while its approaches on one side admit of six lines and on the other of eight lines. This condition of affairs causes an overcrowding of this monumental thoroughfare at certain parts of the day, and an annual expenditure on the part of the city of $3,750 for the maintenance of a special police force to preserve the necessary order and regularity of movement. A proposition has been introduced into Parliament to remedy this evil by increasing the width of the bridge to seventy-six feet two inches by removing the present stone parapet and substituting a structure of iron, in the form of heavy corbelled balconies, apparently, which must project some ten or eleven feet on either side of the roadway over the sides of the bridge. The Royal Institute of British Architects as a body, and several leading architects personally, have protested against this desecration of a famous monument, and the conservative spirit thus aroused has been sufficient to arrest the progress of the bill through the House of Lords at so late a stage as its third reading. What may be the final fate of the bill does not appear. The council of the Institute expresses its unanimous conviction that if the width of the bridge must be increased, the right way to do it is by adding what may be required in masonry of exactly the same design as at present. The *Builder* draws attention to the fact that when the bridge was constructed the margin of stability was so narrow that after the fifth arch was keyed, not only did the crown of it subside four inches, but it was found that the down-stream side of the bridge settled from ten to fourteen inches more than the upper side before it reached the final bearings of the structure as designed and built by Sir John Rennie. From this it is argued that the imposition upon the original foundations of a mass of supplementary iron-work, added for the express purpose of allowing a heavier moving load to come where never contemplated by the engineer, would endanger the stability of the whole structure. We as Americans can contemplate the economical and practical questions involved in this controversy with great equanimity, if not with indifference, but as regards the preservation of this noble monument in its familiar shape (though in its present form not more than half a century old), it is so associated with the most characteristic aspects of the city that we are disposed to be more conservative even than the English architects themselves; we instinctively rank it with the Tower of London and the Dome of St. Paul's, and cannot but regret the prospect of a change which from a sentimental and from an artistic point of view seems to be of exceedingly doubtful expediency. It is a curious fact, by the way, that this proposed disfigurement of one of the finest structures of its kind in the world seems to be regarded by the general public of London with complete indifference; even the Society for the Protection of Ancient Buildings, so jealous of any interference with the old churches, which may or may not be connected with local history, does not lift a finger to preserve this, the most conspicuous monument of them all, from being overlaid with some unspeakable apparatus of cast-iron.

Scenes upon London Bridge, both in its ancient and in its modern form, are so picturesquely associated with the social and political history of the metropolis, and with English literature in general, that this great thoroughfare may be accepted as the centre of life in the metropolis of the modern world, as upon the Via Sacra was concentrated all that was most characteristic in the life of ancient Rome. Every day between eight A. M. and eight P. M. more than twenty thousand vehicles and more than one hundred and six thousand pedestrians crowd over the bridge with a continuous roar of traffic. The picture of this multitudinous but steady and well-ordered torrent of human life, with all its suggestions of complicated and world-wide interests, flowing over a causeway which, though more than fifty feet wide, is insufficient for its convenient progress, is very characteristic. No less so, but in curious contrast, is that presented in Mr. Edward I'Anson's interesting paper read before the Royal Institute of British Architects, on the 9th of June, on the Roman Forum, the focus of the metropolis of the ancient world. "The Via Sacra," he says, "through which we are told the Emperors of Rome passed, followed by captive potentates, with the trophies of victory, and long trains of armed warriors and slaves; where, on their way to the capitol, the victorious emperors proceeded to solemnize their triumphs with religious rites, and the captive kings were led to their prisons; where the great annual religious processions of the people, carrying their images and their gods, passed on their way to the Palatine Hill; this great thoroughfare of Imperial Rome was *only twelve feet wide.*" How long the ædiles of modern London or of still more modern Boston, with its inheritance of narrow streets, would have suffered such a constriction of travel as this implies may be easily imagined: the arch of Septimius Severus would have fallen at the edict of the Common Council of the time, just as that of Temple Bar has fallen, and the Basilica Julia would have been pared off with as little compunction as the architectural blocks that stood in the way of New Washington Street, in Boston, or obstructed the passage of the great thoroughfares of modern Paris.

If a society for the preservation of ancient buildings has an existence in Venice, its deliberations must long have been embarrassed by the amount, importance, and character of the dilapidations among the historic buildings of that city; and now Mr. Ruskin should certainly be summoned to assist them, as the authorities have been lately impelled by the dangerous condition of the southwest angle of the Doge's palace — that towards the columns of St. Mark — to put into execution plans long since arranged for the rebuilding of the façade towards the Giudecca, which we believe is the most ancient part of the structure. It is said that the process of decay was proceeding so rapidly that no half-way measures could save it. The columns were out of the perpendicular, and the arch-stones slipping from their places. We learn that at the point named the arcades of the first and second stories have already been taken down, but that the famous group of Adam and Eve on the corner has been carefully preserved. Certainly here is an opportunity, if ever there was one, for the most patient exercise of all the virtues which can be demanded of the restorer. To what extent respect for antiquity will permit the insertion of new material, new facings, possibly new carvings, to make good the obliterations of time in the details of this edifice so hallowed in the service of art, is a question which the modern conscientiousness in such matters has rendered exceedingly delicate. The Italians have hitherto not exhibited much of this quality in the treatment of their antiquities, and it is to be feared that at least English sensitiveness is destined to receive a shock. It is worthy of remark, by the bye, that the character of these dilapidations and the fact that the most imminent danger exists at the corners amply demonstrate the fundamental structural weakness of this famous monument, and the absence of due consideration of statics in the designing of it. No modern architect, with a proper knowledge of the necessary relationship existing between structure and design, would venture to superimpose a great unbroken mass of wall upon two open arcades, of which the upper, though very beautiful, is singularly ill-adapted to withstand an accidental strain, without a strong and visible expression of abutment at the angles. But such an expression would have deprived the Ducal Palace of its most picturesque and characteristic feature.

The Royal Gold Medal for the present year, the highest honor in the power of the Royal Institute of British Architects to bestow, was, on the 23d ultimo, presented to the Marquis de Vogüé, Ambassador of France at Vienna, the distinguished archæologist, whose contributions to the knowledge of the remains of Greco-Roman architecture in Syria and Asia Minor are of inestimable value. His most famous work, La Syrie Centrale, is illustrated by a remarkable series of plates setting forth with admirable exactness and distinctness a chain of monuments of early Christian architecture of elegant and curious stone construction, which have the rare merit of being novel, instructive, and interesting alike to the architect and the antiquary. The cosmopolitan spirit with which this distinction has been conferred by the Institute may be inferred from a list of the medalists: among the English recipients are Sir Henry Layard, and Messrs. Cockerell, Barry, Smirke, Pennethorne, Wyatt, and Fergusson; the French are MM. Hittorf, Texier, Duc, Leseur, Viollet-le-Duc, and the Marquis de Vogüé; and Herr Lepsius represents the German element. We understand that it is the custom of the Institute to bestow the medal upon a foreigner every third year.

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AMERICAN DRAMATIC THEATRES. II.

AT the very beginning in theatre planning one is confronted by the fact that the buildings, audiences, and entertainments with which he has to deal are, from a combination of conditions, subject to greater danger from fire and panic than under ordinary circumstances. The general reasons for this danger lie in the amount of temporary, changeable, and necessarily combustible material used for scenic effects; the powerful and general illumination required; and the stimulated and excitable condition of audience and performers. To intensify these a very marked factor in the estimate of hazard is found in the general and not unreasonable belief that the theatres of to-day are more or less unsafe. At the dedication of one of these, about two years ago, it was said by a prominent public man that he had spoken in about one hundred opera-houses in various parts of the country, and had never done so without first looking to his means of escape. The statement was entirely just; for until recently, and with a few prominent exceptions, the American fashion has been to gain all the show, convenience, and even luxury, attainable, with little regard to security. To reform this altogether is the missionary duty of the architect; and the chance of doing so is better than might be supposed; for the projectors of theatres and their managers are often liberal as well as shrewd and practical men.

The spasmodic and intermittent demand of the public for absolute security requires guidance in the light of reason. There is no such thing as absolute security to frail humanity; and in a new country rapid progress and intense activity multiply the dangers to life and limb. The requirement then in theatre-building must be a reasonable approximation to safety, in keeping with other good building of the time, and equivalent to what is demanded in other public works; and in all practice a steady advance towards perfection.

In the choice of a site, or rather in the use of a site, — for the architect seldom has a voice in the selection of the lot for this purpose, — is found the first serious obstacle to perfect safety, elegance of design, and even convenience. The enterprise must be a paying one. Where the ground is valuable, rear land must be utilized, or the lower floor must be devoted to shops. Neither of these conditions is conducive to the greatest measure of security. But the law allows them, and is likely to; and a condition of things many times worse is permitted by the authorities of most American cities in places of the kind already established. To make and enforce a law compelling theatres to be isolated would simply result at present in the prohibition of nine tenths of the theatre building. If the walls against other structures and on narrow courts and passages are made solid, of brick, sufficiently thick and with high parapets; if entrances, either by passage or by staircase, are absolutely proof against fire and smoke for a reasonable length of time, we have, with other common precautions, as safe a condition of things as can be expected immediately. But the simplest way to safety lies in the reduction of the size of the hall. A great crowd on a prairie may in a sudden rush knock down and trample some of its number to death; it is in the combination and concentration of many forces that the danger arises. The safety lies in the limitation of numbers, and in division and diffusion of hazardous energies. A free, level passage-way for exit may, under some circumstances, prove worse than several narrow and circuitous ones of equivalent width.

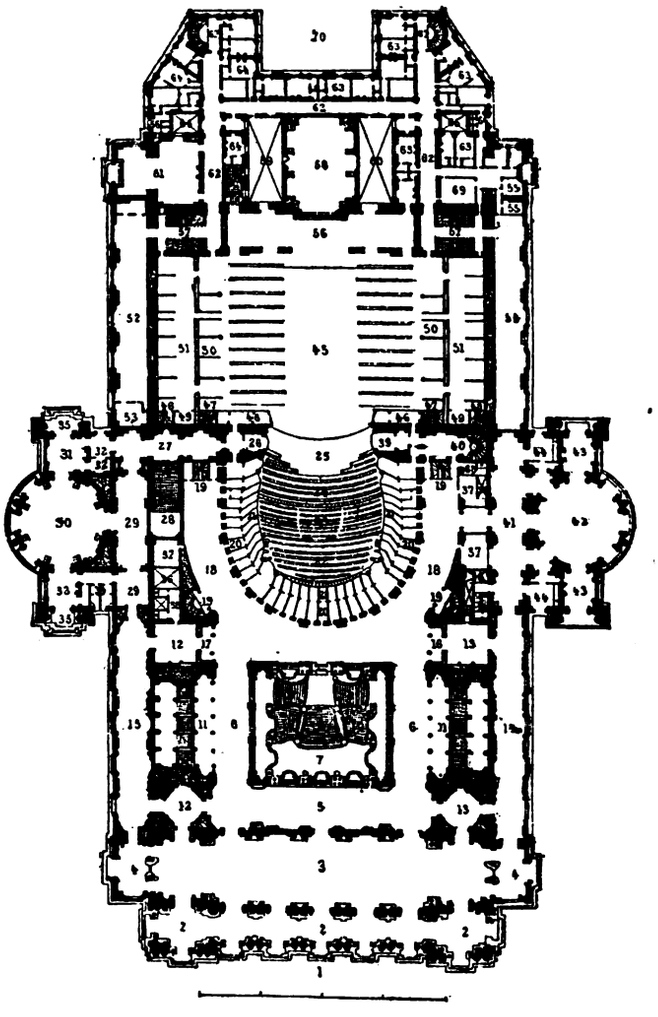
In the majority of American theatres the architecture of the exterior is conspicuous by its absence; or, if the building is in a position to be seen, the difficulty of fitting outside to inside lines, where the former are expected to be somewhat regular, is much increased by the lack of intervening lobbies, vestibules, and ante-rooms, which in foreign practice conveniently assist in marrying façade to plan without help from shams in the shape of false windows and the like. Although the requirements of the interior may remain unchanged, in many cases the restrictions imposed by want of room and irregularity of contour of the proposed site necessitate fresh expedients in each new case. It is very easy to plan a good stage and auditorium with ample land and equally ample expenditure; but where both are closely restricted, it becomes one of the most intricate problems with which one has to deal.

It will be seen by reference to the accompanying plan of the New Opera-House, Paris, that the theatre proper does not occupy one half of the building; the remainder being devoted to grand vestibules, halls, etc., the whole constituting a palace for musical and other festivals, rather than a lyric theatre.

A theatre, more than most other buildings, depends on fitness for success. No amount of elaboration of parts or excess of decoration can compensate for lack of practical qualities. No building is more difficult to understand from the drawings, and the inexpert can form no conception of the final effect of a work of this nature from any amount of pictorial illustration.

Theatre building has generally been stigmatized as sham; the permanent parts being often confused with the temporary machinery for scenic effect. But although there undoubtedly has been some very bad work done and many blunders made, as a class such structures are little if any worse than the average of buildings. In a late and famous example of church building, one may find the massive brick piers, disguised by lath and plaster screens, made by the help of bronze paint to stand for clustered metallic shafts. If the Lord's houses are fruitful in such misleading examples, what can be expected of the temples of amusement?

Small theatres have been found to pay better, in the long run, than larger ones. They require less scenery, a smaller ballet, orchestra, and mechanical force, less gas, fewer ushers and doorkeepers, and the general reduction of expenses is very considerable. When only partially filled the auditorium presents a more cheerful appear-



2, Loggia; 3, 4, Foyer; 5, 6, Stair-well; 7-10, Grand stairway; 11, Stairway to upper boxes; 14, Refreshment-rooms; 15, Smoking-room; 18, Box-Corridor; 19, Secondary stairways; 20, 21, First tier of boxes; 22-25; Auditorium; 26, State-box; 27-35; State apartments; 36-44, Restaurant; 45, Stage; 58, Foyer de la danse; 61, Foyer du chant.

The New Opera-House, Paris.

ance; and, though the money gains are somewhat reduced, the chances of loss are lessened in a greater measure. More than this, they are more suitable for the comedies and light pieces most in vogue, and their audiences are enabled to see many fine points of make-up and acting either lost or necessarily burlesqued in a larger house. But, added to these considerations, they may be made in every way much safer. By small is meant with an auditorium to seat not over 1500 persons, or still better not over 1200, and a curtain opening about thirty feet wide. Assuming that the size does not vary materially from this standard, the natural division of the building is into entrances, — under which head would be included lobbies, stairways, retiring-rooms, and all the space outside the hall proper intended for the convenience and safety of the public, — then the hall, or auditorium (the shorter word seems preferable, and will be hereafter employed), with its divisions of floor, galleries, and boxes, and lastly the stage, with rooms for assembly, administration, dressing, storage, and mechanical departments. In the late French examples these divisions are plainly indicated in the design of the exterior, which really seems made up of three buildings, in the same general style, set together for convenience of use. It would be difficult for the intelligent observer to mistake the character of the New Opera-House at Paris. The uses of the three great divisions are so distinct, and their absolute separation so necessary, that there seems to be no room to cavil at the propriety of such a treatment, no matter in what style the building may be designed.

The same general combination of parts was shown in several modes in the competitive designs for the new Shakespeare Memorial Theatre at Stratford-on-Avon, England. J. A. F.

RECENT MODIFICATIONS IN SANITARY DRAINAGE.[1] I.

IT is only about four years since I published in these pages a series of papers on The Sanitary Drainage of Houses and Towns. So far as possible, I therein stated fairly the condition of the art at

[1] A paper by Col. George E. Waring, Jr., published in the *Atlantic* for July.

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that time. Viewed in the light of present knowledge on the subject, those papers are already, in many respects, quite out of date. Knowledge has increased, experience has multiplied, and invention has been most fertile. The illustrations then given of the arrangement of house-drainage represented a soil-pipe and drain running in an unbroken course from the sewer in the street, under the basement floor, and up through the roof of the house. Connected with it were several water-closets, a sink, and the overflow-pipes of the tank in the attic and of the service-cisterns of the closets. In all cases the different vessels were separated from the soil-pipe only by water-sealed traps, and only the same protection was afforded in the case of the main tank. The system thus represented is defective in several particulars.

(*a.*) The water of the tank is liable to dangerous contamination through the overflow-pipe which leads into the soil-pipe, with only the insufficient protection of a water-seal, — especially insufficient as it has no certain means of renewal, and may by evaporation give direct access to the air of the soil-pipe.

(*b.*) The overflow-pipes of the service-cisterns may readily become channels for the introduction of drain air to the apartments.

(*c.*) The unprotected traps of the sink and the water-closets are inadequate for the work they are intended to perform, and all of them are susceptible, under certain conditions, of becoming empty by evaporation or by siphoning.

(*d.*) Although the soil-pipe is continued through the roof, full-bore, and is open at the top, it has no provision for the admission of fresh air at its foot, which is now regarded as a matter of imperative necessity. These defects are sufficient, in the opinion of those instructed in such matters, to condemn this whole arrangement, which only four years ago was regarded as the best yet devised.[1]

All this indicates that the art under consideration is undergoing rapid development, and that it is by no means to be assumed that we have yet arrived at ultimate perfection in the matter.

Were I called upon to-day to specify the essential features of perfect house-drainage, I should include the following items: —

The establishment of a complete circulation in the main line of soil-pipe and drain, allowing a free movement of atmospheric air through the whole system from end to end, together with as complete a circulation through minor pipes as could conveniently be secured.

The complete separation of the over-flow of every tank or cistern delivering water for the general supply of the house from any soil-pipe or drain containing a foul atmosphere.

The supplementing of every water-trap with a suitable mechanical valve, to prevent the water of the trap from coming in contact with the air of the drain.

The reduction of the size of all waste-pipes, and especially of all traps, to the smallest diameter adequate to their work.

The abolition of all brick or earthen-ware drains within the walls of the house, using in their stead the best quality of iron pipe, with securely caulked lead joints.

The substitution, so far as practicable, of wrought-iron pipes for lead pipes, in the case of all minor wastes.

The coating of all iron pipes, both cast and wrought, inside and out, with "American" enamel, a glossy black coating which withstands in the most complete manner the chemical action and changes of temperature to which it is subjected in such use.

The iron pipes should be extended so far beyond the foundation of the house as to obviate the opening of joints by settlement, so common where earthen-ware drains are subjected to a slight movement of the foundation, or of the new filling about it.

The object to be sought is the provision of a permanent drainage channel for the removal of all wastes, offering little asperity for the adhesion of foul matter, swept from end to end by fresh air, absolutely separated by mechanical obstructions from the interior atmosphere of the house, and literally a section of out-of-doors brought for convenience within the walls of the house, open to receive the contents of the various waste-pipes leading to it, but securely closed against the return of its air. I believe that the next step in advance will be the establishment of means by which the whole length of this drainage channel may be thoroughly flushed with clean water at least once in twenty-four hours.

As a prominent detail of house-drainage work, the long-accepted water-closet is being made the object of important modifications. The stereotyped article, the "pan" closet, has little to recommend it beyond the fact of its general adoption. It is faulty in principle, in arrangement, and in construction. While it is cleanly to look at, and lends itself readily to ornamental joinery, it has defects which should drive it out of existence. Deep down in its dark and hidden recesses, where only the ken of the plumber ever reaches, a large and sluggish trap — they call it a "cess-pool" in Scotland — is generally holding the filthiest filth in a state of offensive putrefaction. The iron chamber above this is lined with the foulest smear and slime, constantly producing fetid and dangerous gases. The earthen-ware bowl which surmounts this is set in putty, which yields to corrosion and to the jar of frequent use, until it leaks foul air, often in perceptible quantity. The panful of sealing water soon becomes saturated with foul gases, which exhale thence into the house. The whole apparatus is incoffined in tight-fitting carpentry, which shuts in the leakings and the spatterings and their vapors from the free access of air, boxing up in the interior of the house, and generally in free communication with the spaces between the walls and under the floors, an atmosphere heavy with the products of organic decomposition, and faintly suggestive to the unwonted nostril of the *mus decumanus defunctus*.

[1] This illustration was taken from the latest accepted English authority on such subjects.

Some of these defects were recognized and pointed out in my earlier papers. I then believed that the difficulties of the case had been solved in great measure by the Jennings closet. It now seems that this closet and the whole class to which it belongs are seriously defective; and, in the absence of anything better, I am disposed to go back to the simple "hopper" closet, such as is used in the cheapest work, and to depend on frequent and copious flushing to keep it clean. This closet has the great advantage that its only trap is in sight at the bottom of its pot. There is no inner "chamber of horrors" concealed by a cleanly exterior. I have recently used a number of these closets supplied with various sorts of apparatus for periodical flushing, and I find that wherever a half-gallon flush can be given every ten or fifteen minutes they are kept perfectly clean. I have no doubt that flushing every twenty minutes, or perhaps at longer intervals, would keep them free from all sanitary objection. This would require a supply of about fifty gallons *per diem*.

The Hopper Closet.

Recent invention has been turned in the direction of the provision of mechanical appliances for separating the trapping water from the air of the soil-pipe or drain. There are several devices which accomplish this purpose, — one of them my own, and more than one of them constituting a very great improvement upon, and indeed an absolute step in advance of, anything in use five years ago.

Another most important matter of recent development is the through-and-through ventilation of soil-pipes. Formerly the soil-pipe invariably stopped at the highest closet of the house. When the danger of *pressure* came to be understood, it was considered imperative in all work of the best class to carry a vent-pipe out through the top of the house. As this pipe, from the smallness of its size and from the irregularities of its course, had but limited capacity of discharge, the necessity was quite generally recognized for carrying up the soil-pipe itself, full-bore, through and above the roof. This was the point reached at the time of my earlier writing. It soon became evident that even this large extension of the pipe afforded no real ventilation. A deep mine shaft cannot be ventilated by simply uncovering its top. No complete frequent change of air can be effected in a soil-pipe by merely opening its upper end. Air must be introduced at the bottom to take the place of that which is discharged at the top. It is now considered imperative in all good work to open the soil-pipe at both ends, or at least to furnish the lower part of the pipe with a sufficient fresh-air inlet to effect a thorough ventilation of the whole channel.

We have heard so much of "sewer-gas" that we were in danger of ascribing the production of this foul air only to the sewer and cess-pool. Indeed, the majority of sanitarians to this day seem to believe that if they can effect a thorough disconnection between the sewer or drain and the waste-pipes of the house they have gained a sufficient protection against sewer-gas. The fact is that that combination of the gaseous products of organic decomposition which is known by the generic name of sewer-gas is very largely produced by the contents of the house-pipes themselves. Not only in the traps, where the coarser matters accumulate, but all along the walls of the smeared pipes, where filth has attached itself in its passage, there is a constant decomposition going on, which is producing its constant results. The character of this decomposition and the character of the produced gases are greatly influenced by the degree to which access is given to atmospheric air. The more complete the ventilation, the greater the dilution of the gases formed and the more complete their removal, and also the more innocuous their character. Under the most favorable circumstances, the contained air of a soil-pipe must be offensive, and is likely to become dangerous; so that, however thorough the ventilation, we must still adopt every safeguard against its admission into the house. The facility with which foul gases penetrate water and escape from it makes the water-seal trap, which is now our almost universal reliance, an extremely inefficient protection. There can be no real safety short of the adoption of some appliance which shall keep every outlet securely closed against the possible return of drain air.

Mr. Elliot C. Clarke, the principal assistant engineer in charge of the improved sewerage work of Boston, in a paper entitled Common Defects in House Drains, contributed to the Tenth Annual Report of the Massachusetts State Board of Health, says on the subject of sewer-gas: "The writer has no wish to be an alarmist. The risk from sewer-gas is probably not so great as many suppose; it is a slight risk, but a slight risk of a terrible danger. If a man thinks there is no need of insuring his house because his father lived in it for fifty years without a conflagration, he has a right to his opinion." Professor Fleeming Jenkin, in his Healthy Houses, says, "Simple sewer-gas is little worse than a bad smell. Tainted sewer-gas may be so poisonous that a very little introduced into a bedroom — so little as to be quite imperceptible to the nose — shall certainly give typhoid fever to a person sleeping there. The germ is a spark, the effects of which may be unlimited. We do not content ourselves with excluding the great majority of sparks from a powder magazine; we do our best that not one may enter."

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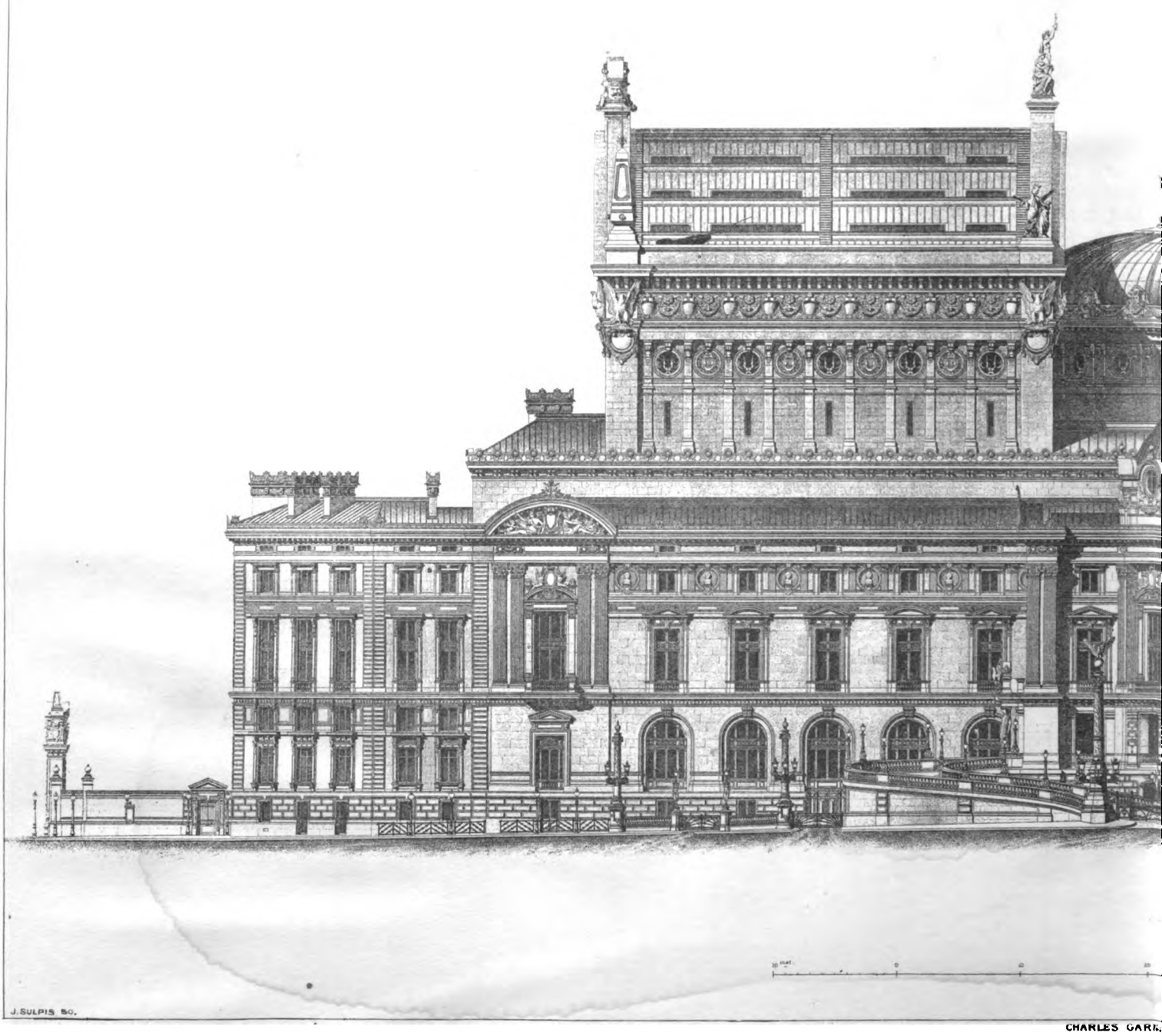
THE NEW OPERA-HOUSE PARIS



J. SULPIS SC.

CHARLES GARN

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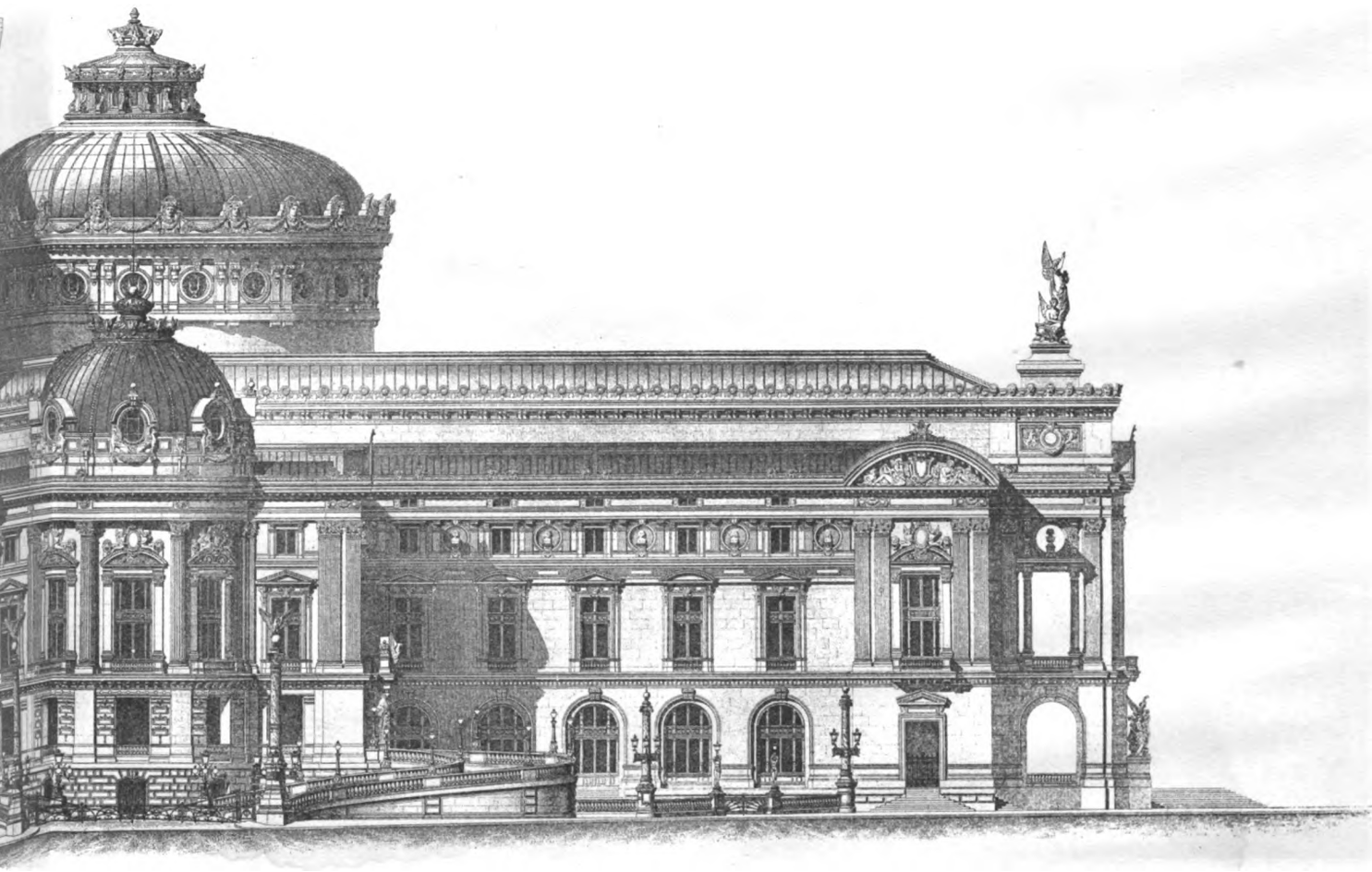

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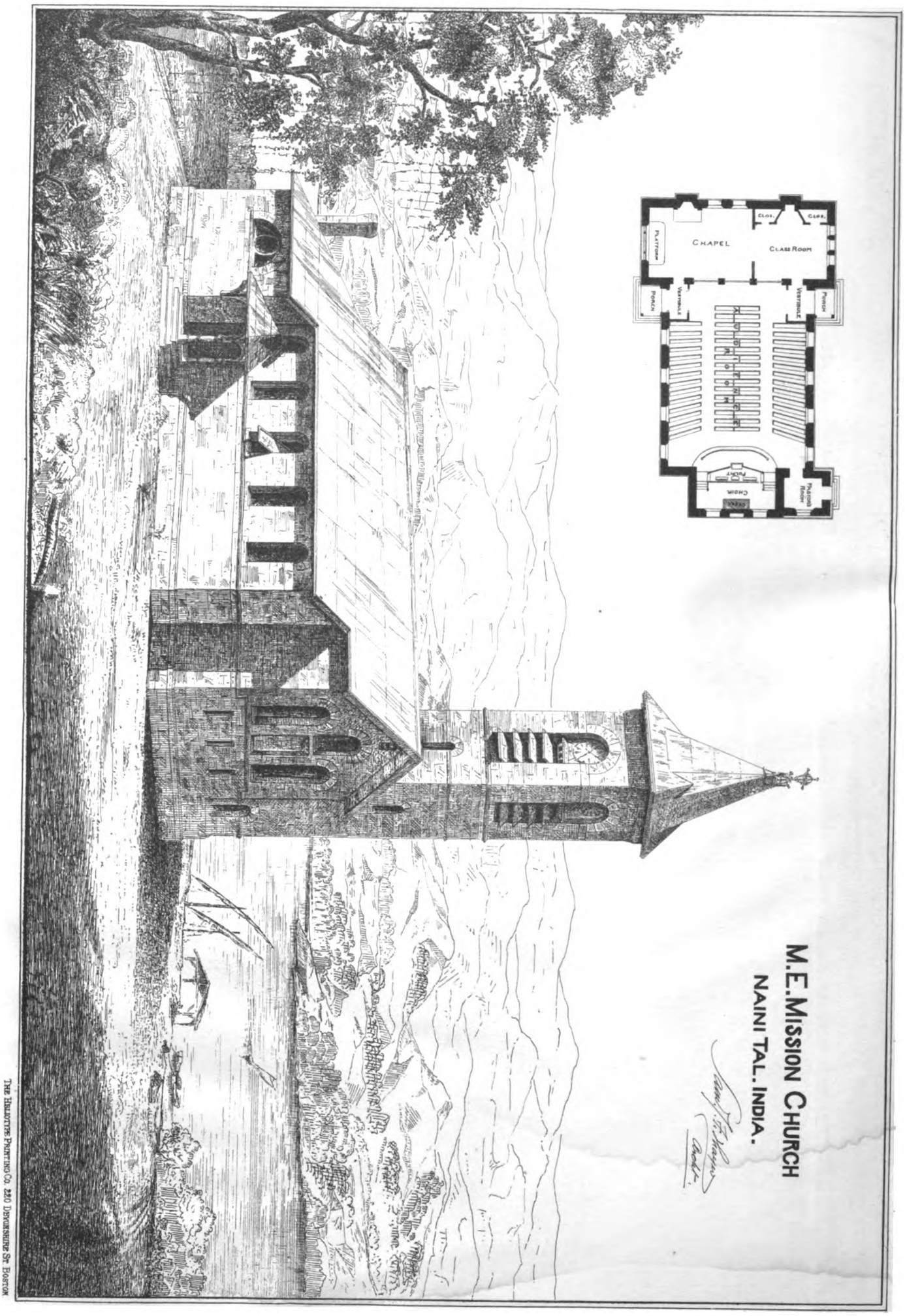

M.E. MISSION CHURCH
NAINI TAL. INDIA.

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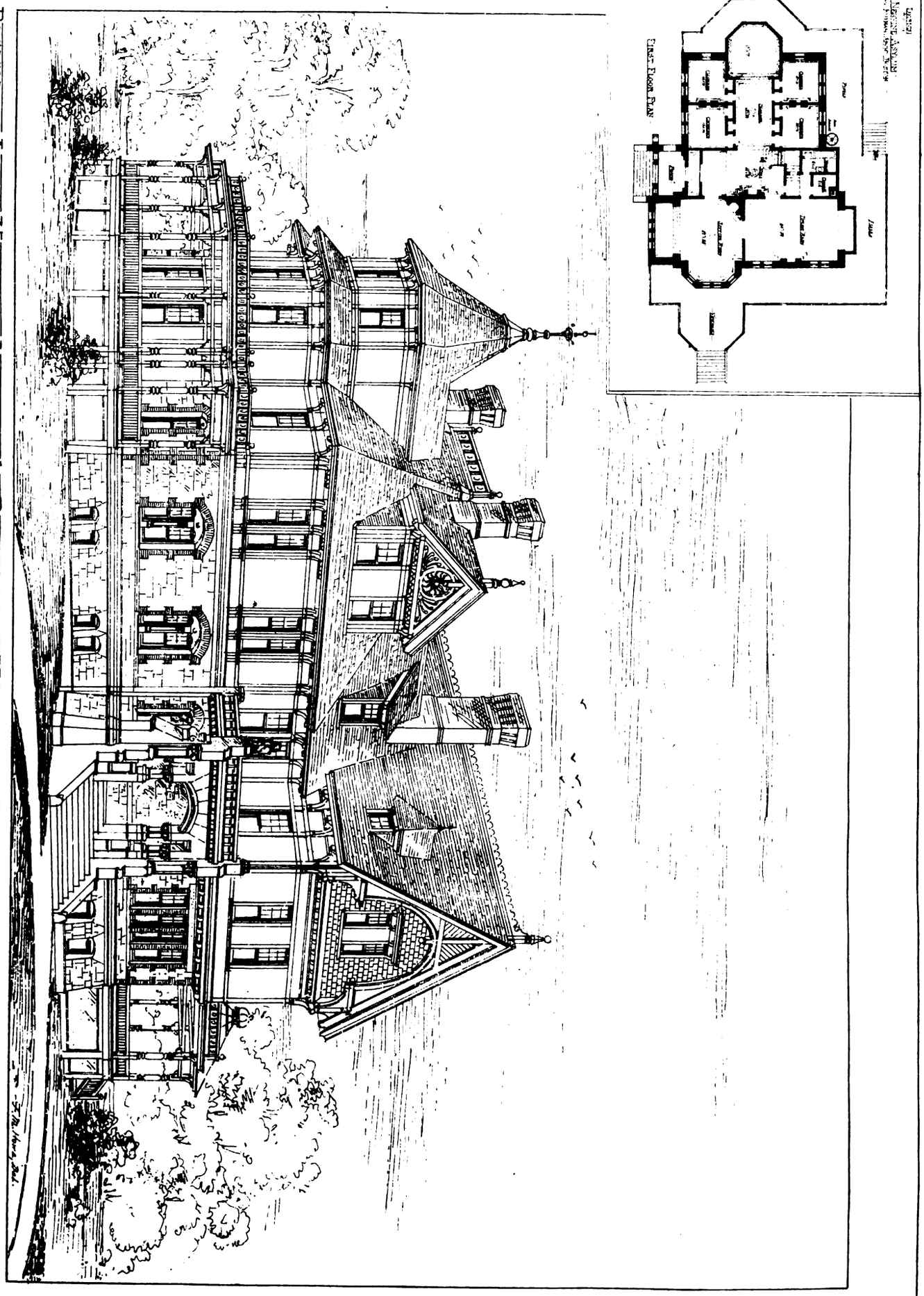

DESIGN FOR ADAMS NERVINE ASYLUM, 1ST PERSPECTIVE VIEW, J. PICKERING PUTNAM, ARCHT. BOSTON.

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While the water-seal is very defective in itself, it is a very important adjunct to any mechanical means of separation that may be adopted, and all necessary precautions should be taken to prevent its removal by "siphoning," — the sucking out of the water by the partial vacuum caused by the flow of water in the main pipe, to which its outlet leads. To prevent this siphoning action often taxes the ingenuity of the engineer more than any other part of house-draining work; and until special devices are made to meet the exigency this must remain the most difficult and intricate part of the house-drainer's task.

Any one whose attention is given to sanitary work must be more and more struck with that peculiarity of human nature which assures us of the exceptional excellence of our own belongings. I have rarely been called to examine the drainage of a house without being told that I was sent for merely as a matter of *extra* precaution. I have never completed any examination without discovering serious sanitary defects, — not merely such errors of arrangement as were universal until a short time ago, but actual, palpable bad condition, which the owner and his plumber at once acknowledged as of a grave character. Leaks in drains under the cellar floor, or in or near the foundation; lead waste-pipes eaten through by rats, and spilling their flow under the house; lead soil-pipes perforated by corrosion; imperfect joints leaking drain air within the partitions; the accumulation of dirty sloppings under the bench of the water-closet; and even untrapped connection between some room and the soil-pipe, or the direct pollution of the air over the tank through its overflow-pipe, — these are most common faults, and some one of them I have found to exist wherever I have looked for them in a "first-class" house, where it was naturally supposed that the most perfect conditions prevailed.

THE ILLUSTRATIONS.

THE LATERAL FAÇADE OF THE NEW OPERA-HOUSE, PARIS, FRANCE. M. CHARLES GARNIER, ARCHITECT.

THANKS to the courtesy of the well-known publishers, Messrs. Ducher & Co., we are able to reproduce as an illustration of the foregoing article, "American Dramatic Theatres, II.," the lateral façade of the Paris Opera-House, which is copied from the magnificent monograph, Le Nouvel Opéra de Paris, which is as yet incomplete. In examining our illustration it should be borne in mind that the reproduction is somewhat less than one fourth the size of the steel engraving from which it is copied.

M. E. MISSION CHURCH AT NAINI TAL, INDIA. MR. S. J. F. THAYER, ARCHITECT, BOSTON.

This church is now building at Naini Tal, in the province of Kumaou, India, about one thousand miles north of Bombay, on the slope of the Himalaya Mountains, a popular resort of civilians and the officers of the British army in India during about eight months in the year. The walls of the building are of a gray limestone, the interior furred and plastered, with an open-timbered tie-beam roof, covered with corrugated iron, the only available material. The cost of the building will be about 18,000 rupees. The mission is conducted by the M. E. Church of America.

THE ADAMS NERVINE ASYLUM, DORCHESTER, MASS. MR. J. P. PUTNAM, ARCHITECT, BOSTON.

This design wa accepted in a small, close competition. The endeavor has been to make the building look as little like a hospital as possible, in order that the inmates may not be unnecessarily depressed by their surroundings.

CORRESPONDENCE.

THE GROSVENOR GALLERY.

LONDON, July 1, 1879.

IN spite of all that has from time to time been urged against it, the Grosvenor Gallery has honorably won the distinguished position it now holds among the art exhibitions of the metropolis; Sir Coutts Lindsay's enterprise has gained a well deserved success. It is all very well to declare it the exhibition of a particular school, — on the contrary, nearly all schools are represented on its walls, — and represented in such a manner, too, as affords some slight chance of their characteristics being studied. It is quite a relief to come from the bustle and the crowd of Burlington House to the quieter, and, shall we say, more refined, atmosphere of the rooms in Bond Street. Then, but for the Grosvenor and its promoters, the works of the particular school referred to would never be publicly seen at all; and whatever opinions may be held as to the merits of Mr. Burne Jones and his followers, they represent a phase of the English art of the day; and even as such, they are worth that attention which all such movements deserve, even from an historical point of view; nowhere, also, are they likely to be so freely criticised as in a public exhibition. If they are good and true as works of art, they will come safely through the ordeal, and flourish on it; if they are simply a sentimental craze, as their enemies assert them to be, then the exhibition will have rendered good service to art in exposing what was false, and teaching us what to avoid.

For the benefit of any of our readers who may not be acquainted with the system on which the Grosvenor is conducted, it may be briefly stated that all pictures admitted to the gallery are there solely on the invitation of Sir Coutts Lindsay; care is taken that just sufficient works are received to cover the walls without any crowding, — none being hung too high or too low to prevent them being well seen. If possible, also, all the works of an artist are hung together, so that they may not suffer from the juxtaposition of pictures in antagonistic styles or scales of coloring. The principal room has its walls divided into compartments or panels by pilasters in low relief; so we often find some artist has a compartment all to himself, or it is shared by the works of a kindred spirit. The pictures are not hung close together, but show portions of the silk-covered walls between them. Marble tables, tapestry-covered chairs, china, and other decorative articles are disposed about the rooms, and help to give them more the air of the apartments of a private house; thus the pictures are seen under more favorable circumstances in regard to hanging and accessories than is at all usual in public galleries, — and this, with the principle of selection by invitation, forms the distinguishing feature of the system. It may be said all this only goes to favor a particular clique of artists and amateurs, that invitation goes by favor; perhaps it does; but the favor is becoming more coveted every day, almost more so than a good place at the Academy. Granted there is a good deal of amateurish work in the exhibition, the fact remains we have here works of the highest merit, but which still would have little or no chance of ever being seen at the Royal Academy; this, then, is one of the chief attractions of the Grosvenor, we are sure to find highly artistic work, much of it belonging to a school which goes for little in any other public gallery.

The present is the third annual exhibition, and contains some two hundred and ninety paintings, and about twenty works in sculpture or terra-cotta, in three galleries and a vestibule. The numbers begin in the West, or principal Gallery; and the first to attract notice are a couple of small pictures by the President of the Royal Academy, Sir F. Leighton, — No. 3, Via Bianca, Capri, and No. 4, Archway in Algiers; clever, classic looking studies, broadly and boldly treated, as are also some other similar studies by Sir Frederick further on in the same room, the latter being notable for the donkeys therein, true specimens of the race as they are to be seen in the East. After some portraits of children and others by Mr. W. B. Richmond, of small interest to any one but their families, the new Oxford Slade professor gives us two classical subjects in No. 8, Phidyle, and No. 22, Sarpedon. The former, a beautiful nude figure offering a sacrifice to Athena, is most charmingly treated; the figure is well drawn, and the color of the whole picture is most harmonious; the altar is in a grove, and Phidyle stands before it with uplifted hands. Sarpedon is a large decorative work; at first sight it looks stiff in drawing, and somewhat hard in treatment, but a little study shows it to be most impressive. The scene is in mid-air at night. Sarpedon having been slain before Troy by Patroclus, his body is being carried by the figures of Sleep and Death —

> "To the soft arms of silent Sleep and Death;
> They to his friends the mournful charge shall bear."

The color is in tones of blue and has a subdued moonlight effect, — the light falling softly on the three figures brings them well out from the background of sky behind and above them, and the Trojan plain and sea below them. Sleep bears Sarpedon on her shoulders, while Death supports the upper part of his body; we might take exception to the unpleasant position of his legs as they come across the shoulders of Sleep, but the latter figure is most powerfully drawn; indeed, the whole composition is most poetical, — by far the finest work we have seen of Mr. Richmond's for some years.

We can only notice the principal works as we pass on. No. 17, Psyche's Toil in Venus's Garden, by Mr. Matthew Hall, is another classical subject; scenes from classic story abound at the Grosvenor, — this is a bit from one of the most beautiful of them. Psyche toils on at the hopeless task set her as a punishment by the jealous and envious Venus. The garden looks like an old English one, with its trim cut hedge, fruit trees, and smooth velvety turf. Psyche kneeling in the foreground over her small heap of seeds is mocked at by the attendants of Venus, as with a sweep of their flowing robes they scatter her work to the winds again. The figures are charmingly drawn, their light draperies contrasting well against the rich foliage of the garden. Psyche, however, has not much "soul" in her face, and looks rather an inane sort of person; still the picture is very poetic in treatment, and successful in coloring.

Two landscapes by Mr. Cecil Lawson are very fine, — No. 18, 'Twixt Sun and Moon, an evening effect, and No. 19, Kent, a view of the hop gardens near Sevenoaks. This latter is truly a magnificent landscape; the time, the afternoon of a bright autumn day. The view is most extensive. The coloring of foliage, red-tiled roofs, fruit trees, hops, and corn is glowing to extreme, so rich are its varied tones, while the vigorous treatment throughout marks it as one of the most powerful landscapes of the year. It is full of work and most artistic work too; there is also no fear of making any mistake about the locality: it is a thoroughly characteristic stretch of English country, recognizable at a glance.

Another vigorous work is No. 24, Light, Life, and Melody, by Mr. H. Herkomer, a scene in a bierhaus in the Bavarian Highlands. The "light" is evening, the "life" is peasants, and the "melody" is being played on the zither by one of the peasants while the others sit listening. This picture is in tempera, but on such a scale that it does not suffer in any way by comparison with the oil pictures alongside. It is well drawn, and the grouping excellent, very powerful in color, and masterly in handling.

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In No. 28, The Sirens, by Mr. Walter Crane, we get back to the classics again. It is not by any means up to what we expect from Mr. Crane. The three sirens are dancing on the sea-shore, while a ship sails past. They look very woe-begone and not at all enticing; perhaps the ship is the Argo with Orpheus on board, and the three beauties, feeling themselves outdone, are about to throw up the whole business, and themselves into the sea, which we know was their ultimate fate. They look as if they knew what was coming and did not like the prospect.

Nos. 35, My Beloved, from the Song of Solomon, and 36, Isabella, from Keats's poem of that name, by Mr. J. M. Strudivick, belong to the Burne Jones school, and are merely imitations of his work, and therefore weak and unsatisfactory.

No. 43, Shipbuilding, by Mr. P. R. Morris, A. R. A., is a bright, sunny picture of a number of workmen round the sides of a small vessel. They are nearly all working on a staging about half-way up the ship's side, and are chiefly remarkable as a study of the division of labor, or a solution of the problem as to the number of men that can be actually employed on one job without getting in each other's way. As the figures are nearly all on the same level they suggest a study also for a frieze.

The works of Mr. J. M. Whistler form one of the features of the exhibition, and we have two "harmonies" and an "arrangement" in this room; the latter is a powerfully painted portrait of Miss Rosa Corder, in "brown and black;" No. 54, one of the harmonies, is in "green and gold," and is a view of the bay of San Francisco with ships at anchor; No. 56 is a very clever work in Mr. Whistler's best manner; the other "harmony" (No. 55) is in "yellow and gold;" it is called The Gold Girl and is a portrait of Miss Connie Gilchrist, the "very well known" actress, in tights, stage boots, and close-fitting vest, going through a performance with a skipping rope, as large as life and twice as natural; the whole picture suggests some practical joke. One wonders not only why Mr. Whistler should waste his undoubted talents in such a manner, but that he should have the coolness to send such a picture to a public gallery, or having been sent, that Sir Coutts Lindsay should so far forget what is due to the dignity of art as to waste nearly three square yards of his valuable wall-space on its exhibition. Mr. Whistler also sends a couple of "nocturnes" (Nos. 192 and 193), but as they are only the usual thing, they call for no special remark. In the same panel with the Whistlers is a most exquisite Study of Drapery by Mr. Albert Moore (No. 59), a single figure of a girl in a yellow dress with an orange head-dress; this is a true "harmony," composed in a most melodious key — quite a relief after the other "yellow" one above mentioned. It is also drawn as Mr. Moore can draw figures, which is nearly perfectly.

Two large pictures by Mr. G. F. Watts, R. A., are hung on the end wall of the gallery, — No. 73, Paolo and Francesca, and No. 74, Orpheus and Eurydice. In the former the tones of color are low, the figures, enveloped in draperies, float in each other's arms, the background being clouds and fiery rain; Orpheus and Eurydice are at the mouth of Hades. Just as they are about to be separated forever, through his fatal error in turning to look at her, his arms are thrown round her in a vain attempt to save her, ere she is swept back into the infernal regions. The treatment is more vigorous and the color more powerful than in the Paolo, but yet neither composition can be said to be altogether satisfactory, the attitude of the figures in the Orpheus group is most unhappy, and the low tone of the colors not by any means pleasing. If the great object of art be to elevate the mind, then we are afraid it will not be much exalted by a contemplation of these two pictures. Strong though they be they fall far short of the ideal treatment of the beautiful legends.

The last works calling for special mention in this room are those of Mr. J. D. Linton and Mr. James Tissot; the former sends six and the latter eight pictures. Mr. Linton has hitherto been known as a water-color painter; here his pictures are in oil, and are remarkable for their power and quality, and in all the costume of the figures forms an important element, showing that Mr. Linton must be well up in matters of dress. No. 79, Les Emigrés, is perhaps the best of the lot, and a replica of a well-known water-color by the same author, depicting one of the old French nobility, in disguise, bargaining with a fisherman for the means of escape to a safer shore. Valentine (No. 81), a figure in armor, and A Trumpeter (No. 78) are also very fine in both color and drawing. As Mr. Linton seems to be an authority on costume old and picturesque, so Mr. James Tissot is evidently the same on what is modern and fashionable; all his works are of the present day, and are remarkable for the dexterity and skill which he brings to bear on "bits" from the every-day life of the better classes. His pictures all hung together make up a splendid show. "How clever," is the general remark as the visitors come up to them, and this "cleverness" describes them very accurately. Mr. Tissot is evidently very fond of the English young lady, for we find her in all manner of subjects. There she is swinging in a Hammock, here she is sitting under a Chestnut Tree; here again she is entertaining two Rivals with gossip and afternoon tea in the conservatory adjoining the artist's own studio. She is always most fashionably dressed, and this "fashion" is painted as only a Frenchman can paint dress, — while all the accessories, such as the plants and garniture of the conservatory just mentioned, the tea-table therein, the hammocks, the hansom cab in which the father, we will suppose, of the young lady is Going to Business, are portrayed with the most wonderful attention to detail. Mr. Tissot is also a very clever draughtsman; his drawing is almost always strictly correct. One of the best pieces of architectural painting we have seen is the view of St. Paul's, in the Going to Business. The hansom is driving through St. Paul's churchyard, and the cathedral forms a great feature in the picture; it is a most careful study, much more so than we usually find in many painters' works, when they have to delineate a building. Here it is not only well drawn but carefully detailed, the perspective being admirably managed; as was also a view of the spire of St. Martin's Church in a picture Mr. Tissot exhibited a few years ago.

Here we must leave the Grosvenor for the present, reserving some remarks on Mr. Burne Jones's works for another occasion.

THE DISCOVERIES IN THE FARNESINA GARDENS.

In a letter to the *Athenæum*, Signor Lanciani says: "The discoveries at La Farnesina are assuming unforeseen proportions. Within that noble palace of the time of Augustus, which I have mentioned in my preceding letter, room after room is entered every day, all ornamented with frescoes by the same masterly hand. Our men have become so skilful in removing the pictures, that the other day they succeeded in bringing safely to their *atelier* near the Palatine one of them 144 feet square, 24 feet long, and weighing several tons. It seems as if the Farnesina grounds have been the field in which the best artists of successive ages have competed for the championship of fresco painting. The names of Raphael, Baldassarre Peruzzi, Il Sodoma, Giulio Romano, have been coupled with those grounds. We are now sanguine of adding another name to the wonderful list by discovering that of the artist who painted the Roman house on which Agostino Chigi built his own. Another problem is raised by the present discovery. The floor of the house is but a few feet above the low-water mark of the Tiber, which flows along its side. So trifling is the difference of level that during the month of May the river has overflowed the house and washed the frescoes no less than seven times. The researches of Professors Secchi, Canevari, Betocchi, and others prove that if there is any difference in the level of the stream between the age of Augustus and the present age, that difference cannot exceed, at any rate, two or three feet. Consequently we ought to assume as a fact beyond doubt that since the house was built and the frescoes painted the Tiber must have entered the apartments several thousand times. This cannot possibly be the case, as the paintings are in a wonderful state of preservation. There is one way only of escaping such contradiction. We must suppose that the Tiber in ancient times did not overflow its banks as often and as completely as it does now. The astonishment expressed by Horace when he saw the inundation reach the Temple of Vesta and the Regia would not be justified if the event was not of an extraordinary character. With us it is a very common occurrence, the ruins of the temple and of the adjoining Regia being inundated several times a year.

"Two striking instances of the wanton destruction of works of art after the fall of the Empire have been obtained in the last days. A few yards from the so-called Temple of Minerva Medica a wall was discovered built with statues. Seven have already been put together, as I mentioned in my last letter. Not far from the same place we are exploring a foundation wall, eight feet square, built with the same materials. The upper strata contain slabs of marble, stripped from pavements and from walls, steps, lintels, thresholds, etc. The middle strata contain columns, pedestals, capitals, all split into fragments. Finally, at the bottom of the wall, statues begin to appear of exquisite workmanship, together with busts, hermæ, bas-reliefs, etc. The stratification of these marbles shows that at the time when the foundation wall was being constructed there was in the neighborhood a shrine, a temple, a fountain, or some such monument, in good preservation, and profusely ornamented. The masons first took advantage of whatever was movable without difficulty, and accordingly we find the statues at the bottom of the trench. Then they put their hands on what was half movable, and this is the reason why columns, capitals, etc., are found in the middle strata. A further want of materials obliged them to attack at last the building itself, its steps, thresholds, etc."

ST. MARY'S CATHEDRAL, EDINBURGH.

The erection of the spire of St. Mary's Cathedral, Edinburgh, has been formally completed by the adjustment of the cope-stone. Springing from the tower of the cathedral, which itself is 142 ft. high, the spire, a stone structure of octagonal form, is carried up till the height of 275 ft. is attained, and above the cope-stone there is to be placed an iron cross 15 ft. high. In the junction of tower and spire a somewhat unusual arrangement has been followed, the tower being changed from the square to the octagonal form at the bottom of the belfry, a stage lower than that at which the spire proper commences. At the point where the change of form is effected, stone pinnacles, each 50 ft. in height and about 9 ft. 6 in. in diameter, are reared over the four corners of the tower. At the base of the spire richness is given to the design by the introduction of four niches, each containing a sculptured archangel, 9ft. 6in. in height, and alternating with these as many Gothic windows, artistically treated with gablets surmounted by crosses. Over these the stone-work is carried up, in the ordinary

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way, till it terminates in a large carved finial supporting the crowning iron cross. The work in this part of the cathedral has occupied eight months, but of course, had the winter been less severe, it would have been completed some time ago. The scaffolding is itself a work of some interest. It is constructed of Norway fir, specially imported for the purpose, and, while remarkably light, in comparison with the cumbrous erections often seen round similar buildings, is at the same time perfectly secure.

A RETROSPECTIVE EXHIBITION AT FLORENCE.

THE municipality of Florence has resolved to hold in November next a great "retrospective exhibition," which shall bring under public observation in the most representative manner possible all the portable art treasures of Tuscany from the remotest times down to the seventeenth century inclusive. The exhibition will be held in the Pitti Palace. It will include not only pictures, statues, drawings, ancient and modern coins and medals, intaglios, cameos, etc., but also paintings on glass, goldsmiths' work, glass, enamels, mosaics, furniture, marquetry, wax models, ivory carving, objects in terra-cotta, enamelled pottery by Luca della Robbia, majolica ware, silks and velvets, brocades, carpets, and laces. There will also be musical instruments, books, manuscripts, bookbinders' work; finally, embroidered cushions, carriages, litters, painted cabinets, optical and other physical instruments, watches, snuff-boxes, objects in niello — in fact, objects of every kind remarkable in the history of art. One thing only will be missed in this representative exhibition — the frescoes which since the fourteenth century have been painted so profusely in all the cities and little towns of Tuscany. But an effort will be made to remedy this blank. Sketches representing those frescoes, with inscriptions indicating the places where they are to be found, will be placed upon the walls, so as to remind the visitors of their existence. There will be Etruscan antiquities from Volterra, Cortona, Arezzo, Pisa, Fiesole, and other places. As to the Middle Ages, it is expected that a valuable collection will be exhibited; and Tuscany possesses such an amazing quantity of art treasures from the fourteenth, fifteenth, and sixteenth centuries, that it is not easy to imagine how even the spacious rooms and corridors of the Pitti Palace itself will be able to contain even a goodly selection of them.

SCHOOL-HOUSE VENTILATION.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir,—Being a constant reader of your excellent journal, and being specially interested in the subject of ventilation of buildings, among which I look upon the school-building as of major importance, I watched with interest for the appearance of the paper on School-House Ventilation by Dr. H. T. Legler, announced in your issue of the 28th of June, and published on the 5th of July, under the comprehensive heading of "Plans and Calculations for a System of Forced Ventilation for School-Houses."

Dr. Legler premises with the conceded fact that "the ventilation of school-houses and other large buildings where a large number assemble is bad." He makes several quotations from the reports of school superintendents of different States to the United States Commissioners of Education, each and all sustaining him in the assertion in the quoted paragraph. He copies from the report of a committee of the New York Board of Education the following: "Of the school-buildings under the charge of this Board, there are not ten which are thoroughly healthy. In several, during the winter, the cold has been so intense at times as to render the dismissal of the classes a necessity. The obstacles presented by school-buildings to ventilation, the great quantity of fresh air required, and the difficulty of obtaining it, without unpleasant draughts, have been so serious and so formidable, that in comparatively few of the school-buildings has any attempt been made to secure a good ventilation." The report contains a description of a number of the direful and fatal results of "bad ventilation" and of "no ventilation;" but I will only quote one common influence that a personal experience of forty years with schools and school-buildings enables me to fully corroborate: "To breathe this foul air tends to produce irritability in teachers and peevishness in pupils. If long continued, the rottenness of the air is communicated to the lungs, and lung diseases are generated. The enormous mortality from diseases of the lungs is in great part attributable to the foul air breathed daily by the children in our schools."

The ventilation used in these buildings, where any is used, is what is called "draught"-exhaust. The most common is the draught produced by opening opposite windows, though heated exhaust shafts are used to some extent; and some examples of this system of exhausting air from a building operate, if well arranged, tolerably well in cold weather, when the building is heated, and when the relative density of the out-of-door air and that in the building is greatest. I have found that it requires at least threefold more fuel for heating an exhaust shaft so as to draw out a given volume of air in a given time from an ordinary building in hot weather, than in extreme cold weather. An experience of three years with a building ventilated by a heated exhaust shaft, in which I have personally experimented and carefully noted the results attained at both extremes, *i. e.*, when the temperature was 98° above and 26° below, Fahrenheit, the building being ventilated by a supply of air drawn through a subterranean air-duct, which delivers it in the coldest weather at 40° above zero, and in the opposite at 55°, has satisfied me that the draught-exhaust in ventilating buildings is impracticable except on a very limited scale. It is defective and unreliable at best, under all circumstances, except a steam-jet-exhaust can be availed of perpetually.

I have recently executed a job of ventilation, where a low temperature and thorough ventilation, or constant change of the air of the building, were very important conditions; these have been satisfactorily secured, but the scale or extent of the work was very limited compared with supplying a school-house for six hundred pupils, requiring for each, say, fifteen cubic feet of air per minute, — total, 9,000 cubic feet per minute.

The steam-jet-exhaust which I used was from a nozzle with only an eight-inch orifice, worked with 40 pounds pressure per square inch, with which I exhausted 417 cubic feet per minute, and drew the air through a subterranean air-duct, 420 feet in length and about two square feet in transverse section. I should state that the walls of the duct were very uneven, and unfavorable to a rapid transmission of air. The duct was blasted mainly in granite rock and the walls and bottom are very rough, thus occasioning great friction and retardation of the air. Air drawn through the duct described, and at the velocity named, is delivered into the building at about 50°, varying from 48° to 53°. This difference in the temperature of the air discharged by the duct is no doubt much increased by the air being drawn through the duct so rapidly that it had not sufficient time *in transitu* to acquire the temperature of the stratum of earth in which the duct lies — it being about 50° degrees uniformly.

I fully concur in the premises taken by Dr. Legler, that, "if we wish to have an effective ventilation under all circumstances and at all seasons of the year, *no other plan is left but forced or plenum ventilation*," or supply; but I cannot indorse his recommendation of a "hot-air furnace," and the use of other than steam power with which to run a fan by which to supply air to the building. I would heat by steam by all means, and would use either a Root's air-pump, or a Cameron steam air-pump, for drawing the air through a subterranean air-duct for supplying and exhausting air at all times, which would be at about 50°, and would only require to be warmed 18° or 20° in the coldest weather. In warm weather, say for four months of the twelve, solar heat absorbed by the walls, both above and below the surface of the ground, will warm the air sufficiently. Then, by having in the heating chamber a plurality of radiators, and of varied capacity, the air may be heated as desired before it enters the rooms, and with great nicety and equal economy. The economy of obtaining the air-supply through a subterranean duct for cold weather is so great and so apparent that comment on it would be a reflection on the intelligence of the reader. The salubrity and delightful temperature of a building properly tempered and ventilated on the plenum system, when the air is obtained through a subterranean duct, during the heated term, is so superior to all other systems known, that there is no comparison between it and other methods of air-supply.

An experience extending over an area of fourteen States and twelve degrees of latitude, and from New Jersey to Missouri, and in a great variety of buildings, since 1874, has established the fact that air transmitted by a subterranean duct to a building is sufficiently anhydrated, and is tempered as described; all dust, motes, or pollen it may contain are arrested by contact with the walls and bottom of the duct, which are moistened by condensed vapor; offensive odors it may contain are absorbed by contact with the clay bottom of the duct with which it is surfaced; the air is so purified that it is proof against the influences of mugginess and of frequent and violent electric discharges, so dreaded by dairymen and those who have the charge of substances which are affected by precipitate fermentation and acidification; and, in fact, it is given a degree of purity and adaptability to respiration rarely found in nature. It was my purpose to explain how such air may be most economically obtained, circulated in and exhausted from large buildings, but I shall be obliged to make these important matters the subject of another paper.

J. WILKINSON.

AN INSANITARY BUILDING SITE.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — I notice in your Building Intelligence for June 7 that the "cellar for the Arms Academy has been dug in the old graveyard" at Shelburne Falls, Mass. Does the State Board of Health have any jurisdiction in such matters?

C.

PUBLICATION RECEIVED.

TANAGRA FIGURINES. Boston: Houghton, Osgood & Co. 1879.

NOTES OF EXPERIENCE AND INEXPERIENCE.

30. ARCHITECTURE AT THE UNIVERSITY OF SYRACUSE. — Can you, or any of your readers, give through the columns of this paper any information in regard to the architectural course of the University of Syracuse? Is the course a thorough one and such as you would recommend to an architectural student? Who is the proper party to address? I have written to the professor of architecture twice within the last six months, and have received no reply. By answering any of the above questions, you will greatly oblige,

STUDENT.

[We understand that Professor Comfort, who has charge of the architectural department, is in Europe. Chancellor Haven would very likely be able to answer such questions as "Student" may wish to ask. — EDS.]

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NOTES AND CLIPPINGS.

The Frescoes found in the Farnesina Gardens. — With the exception of the two largest ones, each of which covered the whole wall of a room, the frescoes which were lately discovered in a building unearthed in the Farnesina Gardens, in consequence of the Tiber improvements, have been carefully and successfully removed by two experienced artists who were summoned from Pompeii, where they had had experience in such work. In all there are thirty-two of these frescoes, which are executed in the best style of Græco-Roman art, the drawing being remarkably accurate, while the coloring of the graceful figures in the compartments of the friezes is said to resemble that of Dutch sketches. The condition of the frescoes is wonderfully good considering that they have not seen the light for nearly twenty centuries. At present they are stored away, each in its separate case, so that the plaster on which they were painted may not be broken, in a hall attached to the Church of SS. Cosmo and Damiano. Here they are to be framed so that they can suffer no deterioration, and will then be placed in such museum as the authorities may determine.

Discoveries at the Site of Sybaris. — A correspondent at Naples writes as follows to an exchange: —

"An important discovery has been made on the site of the ancient Sybaris. It consists of two 'laminette' of gold with Greek inscriptions upon them. They are now under the examination of the Director of the Excavations throughout Italy, the Senator Fiorelli, and precise details will not be known until he has drawn up his report. Hereafter the laminette will be deposited in the National Museum of Naples. That much of great artistic value yet remains to be discovered in Magna Græcia can admit of no doubt. Within my memory great success has attended excavations made on the other side of the Apennines, and if the interest of the archæologist were less absorbed by Pompeii and other places nearer home, Magna Græcia might be compelled to give up vast treasures. The government allowance, however, for these works is necessarily limited, and it is honorable to Fiorelli that so much has been done under his direction. A word about Sybaris; it was situate on the river Cochile — now the Coscile, emptying itself into the Gulf of Taranto — and contained, it is said, 300,000 men capable of bearing arms. The country round about it is now a comparative desert. Spezzano-Albanese, which is built, if not on, at least near, the site of ancient Sybaris, has a population of a little over 1,000; Roscianum, now Rossam, has somewhere over 7,000 souls; whilst Croton, now Cotrone, which once sent out an army of 100,000 men to reinstate the exiles of Sybaris, has only a small population of about 4,000 persons. All that the financial state of the country permits is being done to disinter the wealth of these old Greek colonies, and more will be done as the prosperity of the country advances."

The Channel Tunnel. — It appears that the boring that is making at Sangatte, in France, is not the beginning of the shaft from which the tunnel is to be bored, but is merely an experimental bore-hole, some five or six hundred yards above the village and about one hundred yards from the shore, so that it is small wonder that for three months the work has been suspended, because of the too rapid infiltration of water, while a new pump of double the capacity of the present one is building, that is, one which can raise about six hundred and seventy-five gallons a minute. The shaft for the tunnel when it is begun is to be sunk in the village itself, and will be sunk to such a depth as the experiments now making shall show to be necessary. The experimental shaft, which is at present only one hundred and twenty-three feet deep, is to be sunk to a depth of two hundred and sixty feet, the diameter of the bore being eleven feet. As the excavation proceeds the walls of the shaft are lined with concrete which is filled in behind a movable case of wood. In spite of the nearness of the sea, the water which filters into the pit is fairly fresh and potable.

The Significance of Salt in Well-Water. — In Professor Lattimore's report on the analysis of well-water, which was proved to be the cause of a serious epidemic of typhoid fever in Rochester, he lays special stress on the significance of the presence of common salt in well-water in general. No single indication, he holds, is of so great sanitary importance in judging of the purity or impurity, and consequently of the safety or danger, of any water. He proceeds then to show that, though from the universal diffusion of this substance in the air and in the soil, we should expect to find it in all waters, whether from rain, springs, or wells, because of its extreme solubility, nevertheless, he argues, the quantity of salt that should be found normally from the causes named in well-water is extremely small, and therefore, whenever "it rises above a very few grains per gallon, it becomes certain that it comes from some other source than the soil;" and he concludes with the logical inference that, as nearly all the salt used for domestic purposes escapes by the way of two channels, the water-closet and the house-drain, we should therefore expect, "what is always found on examination to be true, that, whatever sewage may or may not contain, it always contains salt." A fuller abstract of this portion of Professor Lattimore's report will be found in the *Popular Science Monthly* for July. In this connection it may be stated that Professor Nichols, who makes most of the water analyses for the Massachusetts State Board of Health, recommends the use of common salt in cases where a well is supposed to be contaminated by sewage. The water is first tested quantitatively for sodic chloride, then after the amount present in solution has been determined, common salt is thrown into the suspected cesspool or drain, and subsequent quantitative analyses taken at intervals attest the fact of the purity or the contamination of the water, as well as, in the latter case, the degree.

Triangular Blast-Holes. — The plan is favorably received, in an English mechanical journal, of drilling triangular holes for blasting, — that is, holes of a triangular section, instead of circular, as by the ordinary method. To effect this the boring bar or jumper is partly turned on each side of its cutting alternately. No difficulty is experienced in boring the holes to this shape, and they are found more effective than round holes, — the corners forming points at which the fracture of the material operated on appears to commence, the line of fracture usually forming a prolongation of the sides of the triangle.

The Royal Academy and Female Artists. — At the late election of associates to the Royal Academy, Mrs. Butler, better known as Miss Elizabeth Thompson, closely contested the second chair with Mr. Herkomer, the final vote standing twenty-seven to twenty-five in favor of Mr. Herkomer. We believe that there has never been but one female member of the academy, Angelica Kauffmann.

An Architect's Memoirs. — M. Charles Monselet has discovered in the shop of a bookseller on the Quai Voltaire one of the most singular monuments of human idiosyncrasy yet brought to light. It consists of no fewer than forty-five manuscript volumes — quite modern — written in utterly unknown characters. An assembly of *savants*, having been convoked to pass an opinion on the hieroglyphics, declared that they were quite beyond their ken. The form of the letters, we are told, bears, when looked at from some distance, some resemblance to Oriental calligraphy, but this is the only description vouchsafed. Several pages are framed by borders executed with the pen in the most marvelously delicate style — flowers, animals, heraldic shields, angels, landscapes, ruins, etc.; the illuminators of missals produced nothing superior to them. M. Monselet proceeds: "And now what do these forty-five volumes contain? Everything tends to the supposition that they are memoirs, of which the author was so morbidly jealous that he created a writing peculiar to himself for the purpose of transcribing them. And this author is known; he died but a little while ago. He was an architect, very skilful in his profession, and much consulted, M. H. Legrand, to whose pen are due some important works — not in manuscript — that indicate a man of perfectly serious tastes. How, then, can we find an explanation of these many volumes in which are deposited the secrets of his inmost thoughts, destined to die with himself? And in the first place, where did he find time for writing them? I do not exaggerate in saying that by the perfection of its calligraphy, this collection represents more than two years' labor. If it be a mystification, we must allow that it has been carried out with rare patience, but for my part, I prefer to attribute it to a wild and pleasing mania. I feel convinced that M. H. Legrand owed the best moments of his life to his solitary and mysterious occupation. The most surprising thing that could happen now would be to see these forty-five volumes bought up by somebody desirous to decipher the enigma they contain. The bookseller does not despair of coming across such a purchaser." — *Galignani's Messenger.*

The Inventor of Portland Cement. — In 1824 *Joseph Aspdin*, a bricklayer of Leeds, England, took out a patent for making an artificial stone which he called "Portland Cement," the process being essentially the same that is now used in making Portland cement.

Drying Damp Buildings. — It is sometimes of considerable importance that the drying of a new building should be effected in a brief space of time, and sometimes even more so that the means should be at hand for rendering healthy old constructions impregnated by dampness from the soil. M. Ligny has invented an apparatus for this purpose, which is being used in France, and an agency has been established in England. The apparatus for drying includes an ash-pan; a hearth, with rectangular iron fender, about 0.70m. long, by 0.40m. wide and 0.40m. high (the hearth is filled with coke and furnished with an iron plate, which serves as reflector); and ten tubes of iron plate, of about 1m. to 1.25m. long, capable of being lengthened at will, which are placed vertically in the fire in such a way that the lower extremities, extended in the shape of a funnel, cover the hearth almost entirely. These tubes are held by iron props fixed to the fender of the hearth, and are bent in any direction that may be required by means of a screw-compass. When the apparatus is once heated, the cold and damp air passing across the fire is discharged of its dampness and projected very hot against the walls. A small blower may, in case of need, be attached to one of the tubes in order to convey more hot air to a given point, and also to reach certain parts to which the apparatus could not be brought near. For drying old buildings impregnated with damp from the soil, M. Ligny adopts the following plan: First, to take off all plaster on the walls which are damp and full of saltpetre of the room which is to be done; then carefully to remove all joints to half the thickness of the walls, which is done bit by bit, to prevent any risk of shaking the walls. Wet the walls thus cleared several times, and each time dry them by means of the apparatus, in order to dissolve all the saltpetre existing in the materials, then cleanse the walls with rough brushes. After this clearing, drying, and cleaning has been carefully done, the brickwork not containing any more dampness or saltpetre, it is again heated, and in every part (by means of a brush) covered with a boiling liquid hydrofuge, which is rapidly absorbed. — *The Builder.*

White Brick Manufacture. — A process has been patented, and is now being carried out, by Clarke & Pickwell, civil engineers, Lowgate, Hull, for the manufacture of white pressed-bricks from common red clays. Red clays abound in and around Hull, but the white clay which yields the white brick is scarce, and situated at considerable distances from the town. This process consists in mixing or grinding into the common clay a cheap material, — chiefly magnesian limestone, — which has been reduced to an impalpable and harmless powder by being burned and slacked. This mixture is passed through a series of mixing and grinding mills, and so completely ground that each particle of each ingredient is brought into close contact with each other. This mixture is then acted upon as it leaves the last mill by an apparatus which reduces it to a fine grain almost like running soil, in which state it falls through the feeder into the moulds of a powerful steam-pressing machine, is subjected to a heavy pressure, and is delivered at the delivery-table a complete and almost dry-pressed brick, which, when burnt in the kiln, produces a white brick of good quality. The ingredients added to the clay at once absorb about forty per cent of the moisture found in the natural clay, and the grinding is so close and complete that the mixture is thoroughly and evenly amalgamated. The change effected in the color of the red clay on being burnt is due to the presence of the mixture. We understand the bricks can be made at a cost of 20*s.* to 22*s.* per 1,000, the sale price of similar bricks being at the present time 50*s.* to 52*s.* 6*d.* per 1,000 in Hull, and in London 75*s.* per 1,000. The process is said to be applicable to common red clays in any part of the country. — *The Builder.*

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THE problem of cooling houses in summer is one that has been often discussed without leading, unless in a few isolated cases, to any practical results; the means that have been usually proposed — ice or compressed air — being too expensive and too difficult of application to commend themselves to common use. The idea of relying upon the earth as a great receiver of uniform temperature does not seem to have been much considered. In a late number of the *Medical Record*, however, is an article describing a contrivance invented by Mr. J. Wilkinson, of Baltimore, which puts the uniformity of the earth's temperature to a very practical use. Mr. Wilkinson's invention is said to be patented, but is new to us, and will probably be so to many at least of our readers. The room to which he has practically applied it is used as a dairy, in which a nearly uniform temperature is very desirable. A site was taken on a declivity, apparently. The floor of the room was sunk six or seven feet below the surface, and a six-inch air pipe a hundred feet long was carried underground to near the bottom of it, with a pitch of about seven feet in its length, opening to the air at the upper end. A similar pipe of like pitch was carried down from the bottom of the room and opened to the air at a point in the ground at a lower level. There was then a continuous conduit of two hundred feet long and fourteen feet fall, passing under ground from a higher to a lower level and expanding in the middle into a chamber. By keeping the pipe for the most part some five feet below the surface it was surrounded by earth whose temperature in summer and winter did not vary much from fifty degrees. In warm weather the cold air in the pipe poured out at the lower end, and the outer air entering at the upper end was cooled in its turn and followed down, producing a cool draught through the room. In cold weather the air in the pipe was warmer than the air outside, and an upward draught was produced, escaping above and warming the air of the room. By this contrivance, it is said, a uniform temperature of about sixty degrees was maintained in the dairy the year round.

THIS very simple and ingenious contrivance suggests a variety of applications, although it is hardly suited to universal use, for it is not everybody who has room to lay down a hundred feet of underground pipe on each side of his house. Its most natural use, perhaps, is as a refrigerator for those who are willing to pay for having their houses or rooms artificially cooled in warm weather. It would seem more sure of practical success in this office than in the converse process of warming a house in the winter, for it is only necessary in hot weather to lower the temperature of the air a few degrees, twenty at most, to reach a point of comfort; whereas in winter it is often necessary to raise the temperature seventy degrees before we can be comfortable, and the last twenty degrees at least would have to be supplied by artificial heat. To maintain this temperature in an ordinary house during zero weather requires a very large supply of air, because of leakage and radiation, and this would call for an amount of warming surface in the form of pipes, which would be impracticable on the score of economy, especially since they could only serve as an adjunct to the necessary heating apparatus. This difficulty would not occur in applying Mr. Wilkinson's method to cooling houses in warm weather, and the invention would seem to commend itself to those who are in a position to use it. There might also be a field for its use in cooling the wards of hospitals, in which patients suffer greatly during hot weather. The automatic working of the invention, as described above, of course depends on having the two extremities of the air conduit open out of doors at different levels, and there would be danger, we should think, that an ill-timed wind would now and then reverse the current, though these objections might be overcome by the use of a fan wherever there was motive power at hand. It is somewhat surprising that the invention has not been proposed as a means of cooling the fever of debate in Congress and other public assemblies in summer, or of relieving the heat of theatres and other places of assembly, although here, too, the difficulty of modifying the temperature of a sufficient quantity of air comes in as one which it would be costly to overcome, and impracticable under ordinary conditions of space. On the whole, the invention, ingenious as it is, seems at first view to be of rather limited application. But it is a singularly interesting and suggestive one, and it sets forth with emphasis the incongruity of living on an earth which five feet beneath its surface and for thousands of miles below is of unchanging temperature, while in the little superficial film of air a few feet deep which we occupy we suffer from and struggle against every extreme of heat and cold.

THE Committee of the Brooklyn Board of Supervisors appointed to investigate the charges against the architect and contractors of the new jail has submitted its report. As to the first charge, that the granite, which a resolution of the Supervisors ordered to be cut in King's County, is cut partly in Maine, the Committee says that the charge is admitted by the contractors, but that it is averred that employment was given to every King's County man who asked for it, and that to have literally fulfilled the stipulation was to have delayed the completion of the wing beyond the time agreed upon. To the charge that iron sills were substituted for granite by the architect at the instance and for the profit of the contractors, it is answered that there is no evidence that it was done at the instance of the contractors, but that it was declared by the architect to be on the recommendation of the Yale Lock Company, which furnishes the locks for the prison, and that the testimony of experts indicates that the contractors saved no money by the change. The third charge was that granite had been substituted for the Greenwich gneiss required in the ashlar, and that it was of less dimensions than required by the specifications, the stones being thin, and the binders not running through the wall as was specified. To this it is said that the change of stone was allowed under the terms of the specification, that it was no disadvantage to the work, and that the masonry, if not up to the letter of the specification, is admitted by experts to be of excellent quality, and perhaps better than if the specifications were literally carried out. The report, which was laid over to the next meeting, is substantially a repetition of the testimony that was brought out during the investigation, and to which we have already alluded. Whatever may be the rights of the quarrels and complaints that infest this building, we have here, as in Chicago, an illustration of an amusing compensation for some of the evils of the public contract system, which has grown up in the vigorous unofficial supervision of disappointed bidders and workmen.

THE battle over the route of the Inter-Oceanic Canal is still fought, on this side the Atlantic at least, but we are glad to see that in the latest discussions less is said than before about the Monroe doctrine, and more about the practical convenience of the different routes. The American members of the Canal Congress protest that the decision of the congress was purely a matter of wire-pulling and personal influence brought to bear for the sake of franchises that had been obtained in advance from the governments through whose territories it was proposed to carry the canal. In his recent report to the Geological Society, of which he is president, Admiral Ammen complains that personal interests in concessions for the construction of a canal are unfavorable to a fair comparison of projects, and says: "That such personal interests did exist was quite apparent from

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first to last, and the concession was frequently discussed, or allowed to be, especially in the committees." He thinks that the ablest engineers in the Congress generally preferred the Nicaragua route to the Panama. He proposes therefore that the United States Government should treat the question of location as still an open one, and should call a second assembly of engineers, inviting all the governments which were represented at the Paris Congress to send their engineers to take part in the discussion anew, "with the view of removing it from all extraneous influences of concessions or other objections than the consideration of a ship canal across the continent capable of fulfilling the demands of the world's commerce under the most economical conditions."

In the mean time it is a little difficult to see how the balance of probabilities turns. M. de Lesseps, who has shown his prudent desire to consult American susceptibility by his proposition to make General Grant honorary president of his company, is said to be making progress in France toward his subscription of one hundred and sixty millions of dollars, which is the most practical move yet undertaken. On the other hand, Mr. Menocal, in a report which accompanies Admiral Ammen's, argues that the Panama route is likely to be given up for lack of support. A French writer in the *Economiste*, M. Beaulieu, warns his countrymen that after all the Nicaraguan route may have advantages which would lead to building a second canal there, and so rob the Panama scheme of the American trade to which it would look for its chief profits. This last admission, that the canal must rely mainly on American custom, is more to the purpose, it strikes us, than the Monroe doctrine, in showing that it is important to give special weight, not to the fancies and prejudices of Americans, but to their practical convenience and results. The Nicaragua canal, besides being easier to construct, would save to American vessels going to California some seven or eight hundred miles in the sea voyage over that by Panama; but this difference would be more than offset by the extra three days which would be required by the length and the number of locks of the canal, to say nothing of the laboriousness and cost of the transit as compared with a short one at the sea level. The real question seems to be of the difficulty and cost of constructing and maintaining the Isthmus Canal. Here we are a little surprised to be told that the ablest engineers supported this Nicaragua route. Sir John Hawkshaw is a very able engineer, we believe, and his objection that the floods of the rainy season would be likely to interfere with the navigation of the canal told against the Panama project; but the final majority in its favor was for some reason or other overwhelming. The question of cost is, after all, a question for those who will build the canal, while its convenience when it is done will be the determining consideration with those who are to use it. We are inclined to think that if any company succeeds in constructing a direct and clear waterway between the two seas, it need not fear the rivalry of any more obstructed route, however less expensive the other may be. But it is quite possible that the best route has not yet been found. As for the proposed second congress, its deliberations would no doubt be of value, but it might be expected to be pretty exclusively American; for an invitation to foreign governments to partake in it, on the ground that in the previous one they had, through favor for personal interests, committed themselves to a wrong decision, would probably not be welcomed.

French capitalists appear to hold their money ready for investment in improvements on this side of the Atlantic, for a Franco-American company is ready, it is said, to build a ship canal across Florida whenever it can get satisfactory concessions from the State Legislature. An act of incorporation passed by the legislature last winter did not satisfy the projectors, who wished exemption from taxation for a certain number of years; and while the amendment of it was pending, the legislature, which meets biennially, adjourned till 1881. An effort was then made to have an extra session called, but that is made useless by the discovery that the State Constitution forbids such an exemption as is desired, and so the whole scheme hangs fire. The line of the proposed canal is from Jacksonville, up the St. John's River a short distance, and thence across to the Suwanee River, which it follows to its mouth. The project of a ship canal through Florida is one in behalf of which Congress has been often beset, it being expected that the Government would do the work. Two years ago, in answer to a resolution of inquiry passed by the United States Senate, General Gilmore submitted a report suggesting the line for a canal, and the last Congress made an appropriation in the River and Harbor bill of $7,500 for the expense of an examination of the peninsula in the interest of the project. The line prescribed by the Senate was farther north than that proposed by the Franco-American company, being "from the mouth of the St. Mary's River, between the States of Georgia and Florida, through Okefenokee Swamp to some suitable point on the Gulf of Mexico." The work of the examination under the appropriation is not yet finished, but a report is expected at the beginning of the next session.

A number of business men in Boston, members of firms and corporations engaged in various technical industries, have incorporated themselves under the name of the New England Manufacturers' and Mechanics' Institute for the purpose of providing in that city the means and especially the building for a permanent exhibition of industrial art. The Mechanics' Fairs which are held in Boston every three years have been full and interesting; but they have always been rather awkwardly conditioned in respect of exhibition room. It has usually been necessary to combine as well as might be Faneuil Hall with the great hall over the Quincy Market; and this combination of up-stairs rooms which were not specially adapted for such uses has not been satisfactory for either arrangement or access. Being both in public buildings, moreover, they were available only for occasional and temporary exhibitions. The building put up for the exhibition of last fall was a great improvement in point of accommodation, but was never intended, we believe, to be permanent, and indeed the site which it occupied demands for its permanent use a building of a different kind. There is, therefore, still need of a really suitable exhibition building, and if the new association succeeds in providing one it will do good service. It appeals to the whole of New England for support of the fairs which it proposes to hold annually for the sake of encouraging arts and manufactures in that part of the country. We are glad to see that in the circular which we have received the business side of the undertaking is put forward simply, uncomplicated by projects for universal education and the instruction of the public. The charter of the Institute specifies among its objects: "to create and regulate methods of industrial education and to improve the technical knowledge of the members of the society by libraries, technical lectures, and discussions;" and there is mention in the circular of a mechanical museum, intended, as we understand it, to exhibit systematically the elements of machinery; but nothing is said as yet of permanent exhibitions in which the products of manufacturers are at once to provide a systematic course of instruction for the community, and be sold to whoever will buy them. We have an abiding faith in the usefulness of fairs as fairs, but we distrust the prevalent hankering after the Kensingtonian idea which tries to amalgamate education and commerce by turning every bazaar into a museum.

DRY-ROT IN ENCLOSED TIMBER.

A communication from E. A., in another column, continues the discussion of slow-burning construction, turning this time upon the question of dry-rot in timber which is cut off from the air, in respect to which he claims to differ absolutely with us. We are not sure that the difference on this point is so absolute as E. A. declares, although it may be so. We have never argued, for instance, against the expediency of protecting wood with iron lath; on the contrary, we believe in it, — as far as it goes. We have simply offered a caution against surrounding wood with mortar in actual contact with it, as when E. A. proposes to leave "no open space or air behind the plaster," or as in General Meigs's suggestion, constructively excellent, for a lattice partition in which the wooden strips are entirely imbedded in a mass of mortar, a kind of treatment which, however suitable for constructions that are not expected to last long, seems to us to bring considerable risk on those that are meant to be permanent. On the other hand we have understood E. A. to refuse to believe that to absolutely enclose timber in plaster increased the danger of dry-rot.

In answering E. A.'s rejoinder let us then recall our main position, to which he took exception, that whatever encloses timber in such a way as to entirely cut off contact with air exposes it to this danger of dry-rot (so called), and that therefore to embed timber in mortar is a thing which is not safe to recom-

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mend. The theory which we quoted in illustration, that a close covering of masonry is more dangerous than one of iron, and one of mortar still more dangerous, is not one of which we should take the responsibility, and requires for proof or disproof a careful series of observations, which are not at our hand, perhaps have never been made. Assuming the books to be right, the explanation which we offered seems to us reasonable, — that a close envelope which may communicate dampness to the wood is more mischievous than one that keeps it wet. We should not venture to argue, as some writers have done, that to enclose timber in iron is an actual preservative; should go no farther than to say that when wood is placed where it is liable to absorb moisture, an iron shoe, as we said in a paragraph to which E. A. takes exception, "*may* even protect the end of a timber, once securely dried," and it is commonly conceded, we believe, that the cast-iron plates on which it is customary to bed heavy timbers set in brick walls are serviceable in this way as well as in distributing their weight. This obviously requires the condition which we thus took pains to specify, that the timber should be dry and seasoned before it was enclosed. If it were damp or green when it was put in, as most timber used in building is nowadays, or if the enclosed part could absorb moisture from a more exposed part, the impervious envelope would doubtless be more dangerous than the pervious one, and *a fortiori* more dangerous than none at all. The cases cited by E. A. of dry-rot in wood encased in iron shoes and sheet-iron should be borne in mind, but they are isolated, and to know what they teach we should know the circumstances of material, condition, exposure to temperature and moisture. The only safe ground for comparative conclusions would be either in experience wide enough to eliminate accidental differences, or in experiments carefully tried with the same material, in the same condition, and with the same exposure, except so far as concerns the envelope. If any one would test the influence of the enveloping substance by itself, he might take a dozen blocks of like grain from the same stick, well seasoned and kiln-dried. Then let him case half of them in tin, sealed hermetically, — *can* them, in fact, as preserved meats are canned, — and bed the others completely in mortar under ordinary conditions of exposure, examining them all at intervals of years. Most persons would agree, we fancy, as to what results might be expected; how far the conditions of actual practice would give parallel results is to be determined by experience.

The chief practical point is, however, that since wood cannot be actually desiccated and canned for service it is considered best not to enclose it tightly in anything; and admitting that, encased in iron or embedded in masonry, it is liable to decay, it may be expected to suffer in the same way when embedded in mortar, unless there is in the mortar casing some specially protecting influence. We know no facts to show that there is such an influence, and those which E. A. cites do not meet the case. The timbers referred to in the Mason & Hamlin factory are not embedded in mortar, it appears; but are furred before lathing, so that the mortar is not in contact with the wood, except in some spots, which are discolored by it. The casing of furred beams in lath and plaster is not regarded as dangerous, but is done every day, the space behind the mortar commonly proving to give security enough. As for the floors laid in mortar, the case we cited before is an example where contact with the mortar apparently proved injurious, probably by conducting moisture. Like results follow when joists are bedded in the concrete of a cellar floor. To fill in with mortar round the end of a joist built into a wall which may convey moisture from the ground or from the weather is to invite the same danger; to interpose an impervious iron plate is believed to be, in some degree, a protection. The floors cited by E. A. show only, on the other hand, that to lay plaster on one side of a board does not necessarily do harm; nothing more. They do not indicate the behavior of the same boards when surrounded by mortar, still less that it would be safe to embed beams, which are not usually made, like floor boards, of selected stock carefully dried, and which, being much thicker, are much more liable to decay.

There is one fact that might be thought to bear on this question which we have passed over in our former discussion, — the fact that under some circumstances lime has a preservative action on wood. We mentioned in an early number of our paper the process invented by a Frenchman for preserving wood by impregnating it with lime, suggested by noticing that the boards which enclosed old mortar beds seldom decayed.

An illustration which has come under our notice since this discussion was begun is curious enough to be worth mentioning. On some old houses in Long Island whose walls have been shingled for a great many years, thin horizontal lines may be seen running across all the shingles of every course just above the butts. These lines are in relief, — are slight ridges in fact, — having for some reason suffered less than the rest of the wood from the weather, which has worn away the surrounding surface, leaving them slightly raised. Along each line is a row of nails, the shingles being very large and having a lap of nearly a foot, so that it was necessary to nail them near the butts to prevent their curling. The scientific explanation that has been given is this: The ridges mark the chalk lines along which the nails were driven; the lime of the chalk has coagulated the albumen, which is the unstable constituent of the wood, so as to make it insoluble, and therefore weather-proof, and not liable to decomposition. The same explanation applies to the French process just mentioned. Whitewashing, likewise, in which the lime is very much diluted with water, and the undissolved excess soon becomes carbonated, is held to be a preservative. On the other hand the freshly slacked lime of mortar has what appears to be a damaging action on certain kinds of wood at least, — a caustic action like that of the caustic alkalis, — especially on hard woods, as for instance butternut and chestnut, which are blackened by it and, we suspect, injured in texture, as all carpenters know who have had occasion to plaster against one of these woods. It is indeed laid down with authority by some writers that lime mortar causes decay in wood, and should therefore be kept from contact with it. These different facts and statements suggest discrepancies which it is not altogether easy to reconcile. The chief difference that is to be noticed is between covering or saturating the wood by a solution of lime and encasing it in a mortar. To discuss this point in full, however, would carry us too far. We mention it rather as a matter of related interest than as one which is important to our issue, for even if we should deny the theory that mortar injures wood by contact, there is no reason to believe that in any case the preservative influence of a mere coating of lime could extend below the surface of the wood.

We see no reason then to reject the received teaching of experience theory that to embed timber in mortar, or to shut it up tightly in anything else, under ordinary conditions, is — not to cause dry-rot — but to run a risk of it great enough to make the action imprudent.[1] Every received doctrine, however, is subject to revision under new light, and if E. A. or any one else can show good cause for rejecting what is accepted as the teaching of experience in this matter, he may fairly be accounted a benefactor by architects and constructors.

AMERICAN DRAMATIC THEATRES. III.

As the plan of entrances depends in a great measure on that of the hall, it is perhaps best to consider the latter first; and here, disregarding the many absurd attempts at change merely for the sake of novelty, there seem to be two general forms, with their combinations, within the limits of which all the best examples may be classed. Of these the first and most interesting is that of the ancient Greek theatre.

Although in its original completeness not suited to the requirements under consideration, it is worthy of the most careful study. First, because like all structures originating with that remarkable people, it is a perfect solution of the problem involved; and next, because some of its features are, in a modified form, well fitted for modern use.

In the study of the Greek plan one must keep in mind the leading conditions of the relation of their kind of entertainment to their audiences. The term "theatre" is derived from the Greek word signifying "to see." Undoubtedly with them hearing was important, but seeing was essential. On these points Fergusson writes: "The dramas of the Greeks and Romans, or at least those which were represented in their great theatres, were of the simplest possible kind. The action took place on a pulpitum or raised platform in front of a fixed architectural screen. The dialogue was simple, rhythmical, and probably intoned, and the chorus sufficiently numerous to make their united voices heard everywhere. . . . . The wonderful instinct of the Greeks, which enabled them always to do the very best thing possible in all that concerns art, caused them to hit on the very best form in plan for the transmission of the greatest quantity of sound, with the greatest clearness, to the greatest possible number." It should be borne in mind that the regular actors were generally but three in number, occupying probably fixed positions at the centre

[1] The fact that a few years ago several trusses of the dome of St. Paul's Cathedral were enclosed in "stone felt" (a species of cement applied in a liquid state) shows that responsible and instructed persons are not unwilling to incur this risk; but in most places, though not in all, an air-space was left between the cement and the timber. The result of this experiment should be watched with interest, for although the conditions are most favorable, the timbers being completely seasoned, the end is not yet.

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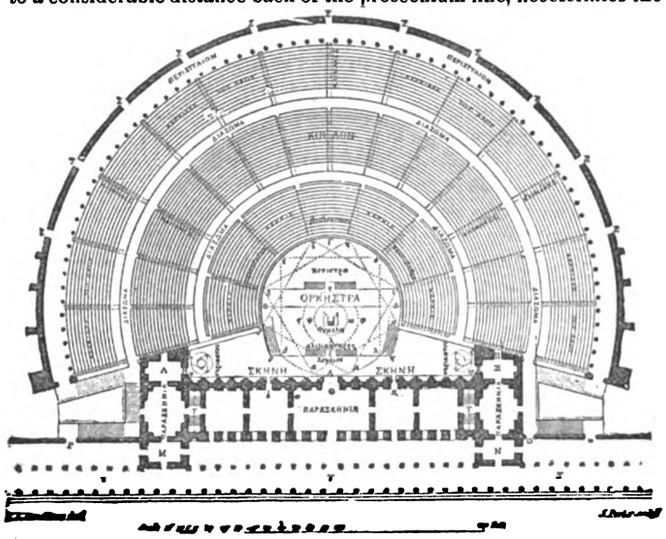
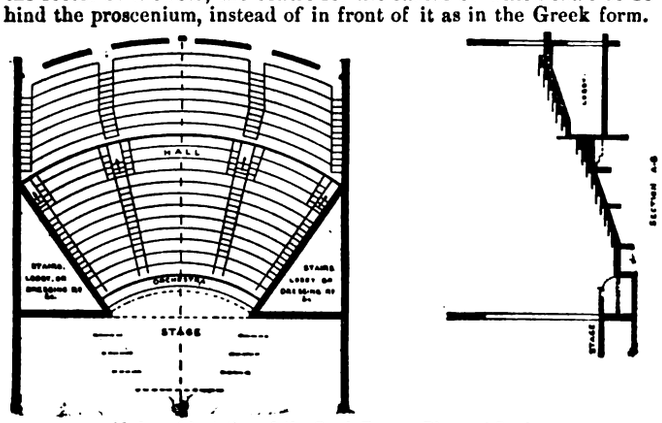
and sides in front of the scene, with the musicians and chorus in front and below them in the orchestra.

In the modern theatre the necessity for seeing into the set-scene to a considerable distance back of the proscenium line, necessitates the



Plan of Greek Theatre, from Stuart & Revett.

abandonment of the end seats of the semicircular plan and an arrangement more in the fan-shape ; or more accurately, a portion of the sector of a circle, the centre for the radius of which shall be behind the proscenium, instead of in front of it as in the Greek form.



Modern Adaptation of the Greek Form — Plan and Section.

The old orchestra, in later days the pit, and at present the orchestra stalls or parquet, has become the best part of the audience-room; and the real orchestra is reduced either to a narrow space in front of the footlights or put out of sight altogether. The addition of a single shallow gallery in the rear would somewhat increase the seating room, and many other minor changes might be made to suit the ever varying conditions. The form of the ceiling in halls of the size under consideration is not of great importance. It should not be flat and unbroken in surface, of course; and few, it is hoped, would be foolish enough to use the open-timbered roof or any combination of Gothic vaulting where good acoustic qualities were essential. Avoiding these absurd extremes, there remains ample chance for good combinations of usefulness and beauty. The most common shape of theatre ceiling is that of a shallow dome, with small lantern, eye, or ventilator, in the centre. This is very suitable. The very best would be a shell form, with its longitudinal and vertical section lines somewhat similar to the sectional lines of the seating inverted.

One excellent result of the Greek disposition of seats, each rising from eight to eighteen inches above the one in front, is not only the free view of the stage, but the opportunity it gives for every one in the hall to see almost everybody else, — the social effect, it may be termed. There is no more valuable adjunct to noble architecture than this sea of interested and sympathetic faces, supplemented by the bloom of color in varied costumes. Any one who has seen the tier on tier of bright and happy children, on the stage of the Boston Music Hall, at a school festival, can readily appreciate the charm of this disposition. To the actor on the stage the effect is most inspiriting, when in answer to his "touch of nature," he can see the flush of noble emotion or the laughter of keen enjoyment sweep over the faces of his auditors as the summer wind ripples over and stirs a bed of flowers. It is a great mistake ever to sacrifice this magnificent element of effect in a theatre.

In this form of hall, with modern construction of floors in place of the solid rock or masonry of the ancient type, the points of egress are multiplied and the audience may be so divided that the very feeling of human sympathy, most delightful during the entertainment and most hazardous in time of panic, may be checked and controlled by separating the crowd into smaller bodies until beyond the reach of apprehended danger. The steep rise of the seats will furnish ample lobby room, easily accessible, and with the barrier of the floor between it and the stage, from which quarter the danger is expected. Fire and smoke naturally ascend. The safe way of retreat then would be in the contrary direction. With a proper disposition of exits, an audience could flow in or out of this form of theatre with an ease and celerity that would appear, as compared to the present system of long narrow aisles, almost magical.

There is one limitation of the Greek or amphitheatrical form that has, more than any other, interfered with its general adoption for theatres, and this may be called the money limitation. The rise of the seats is so great that, if galleries of any considerable depth are added at the back, the hall becomes too high for its other dimensions ; the difficulty of egress from the galleries is increased, and the cost of building greatly enhanced. The carrying up of the galleries to such height makes proper sight lines to the stage impracticable ; and places a large number of the spectators too high for a proper view of the scene, — that is, too far above the horizon line of the scenic perspective. This building up, instead of occupying more ground room, also necessitates additional space for the required long flights of stairs, and greatly increases the hazard to the audience. The constant stimulant to the fashion of large galleries, with lower floor of slight pitch, is in the demand for more seats, at limited expense, and on a given area of land, — a demand which is the continual bugbear of the theatre architect. To satisfy this demand requires a series of most unsatisfactory compromises, generally made at the expense of the comfort, enjoyment, and safety of the public, and equally at the expense of the designer's reputation.

For music halls the Greek form satisfies all needs, and must in the future meet with great favor. It is readily adapted for grand concerts, especially such as include a powerful chorus and orchestra. The oratorio probably somewhat approaches the character of the Greek play, needing but the addition of the dresses and certain formal scenery and very limited action.

A very admirable design for this type of hall is shown on the following page by M. H. Mayeux. This is introduced especially to show the flexibility of the style, and the ease with which it can be adapted to various modern uses and varying forms of ornamantation.

J. A. F.

RECENT MODIFICATIONS IN SANITARY DRAINAGE.[1] II.

In no department of sanitary work has the progress been more marked than in the improvement foreshadowed in my former paper on House Drainage concerning the disposal of the liquid wastes of country houses by the process of sub-surface irrigation. Like all radical improvements, it has had its share of prejudice to overcome, and it by no means found the professional public ready to accept it as the demonstrated success which English experience had shown it to be. It is now quite safe to say that, among all engineers and architects who have given attention to the matter, it is acknowledged to afford the best solution yet attained of this most difficult problem. I know very many cases of its adoption, often without professional guidance and carried out in a rule-of-thumb sort of way, and I have heard of none that is not satisfactory. It does away with that king of nuisances, the cesspool, and disposes of all manner of liquid waste insensibly, completely, and safely. The credit for this improvement is due primarily to the Rev. Henry Moule, the inventor of the earth-closet, and hardly less to Mr. Rogers Field, C. E., who relieved it of its chief embarrassment by adapting to it his automatic flush-tank. This system has recently received the unqualified indorsement of that highest American sanitary authority, the Massachusetts State Board of Health, which in a circular issued in April, 1879, says, "Chamber slops, and slop water generally, should never be thrown on the ground near houses. They may be .... used by distribution under the surface of the soil in the manner described on page 334 of the Seventh Annual Report of the State Board of Health, and now introduced in the town of Lenox, Massachusetts. .... If water-closets are used, and there are no sewers, the best disposal of the sewage is by the flush-tank and irrigation under the surface of the soil, as described on page 135 of the Eighth Annual Report of the State Board of Health."

This system has been in full operation for the entire sewage of the village of Lenox, where it has proved itself an absolute and unquestionable success. The question which seems to arise in every Northern mind when this method is suggested relates to the possible effect of severe frosts. It seems now to be clearly demonstrated that this consideration may be left entirely out of the account, no instance having been cited of the least obstruction from this source. This point will be more fully treated further.

The progress made in the matter of town drainage has not been less than that in the twin department of house drainage; but the advance has been thus far — at least so far as this country is concerned — more a matter of theory than of practical application, and it relates more to villages and to what may be called village-cities than to larger places, like New York, Boston, and Philadelphia.

Sewerage was long confined to large towns, and it reached its development under the direction of engineers trained to foresee all possible contingencies, and to pitch their work on a scale adequate to cope with them. With usually ample means at their command, and with the inclination to work after great models, their works have

[1] A paper by Col. George E. Waring, Jr., published in the *Atlantic* for July.

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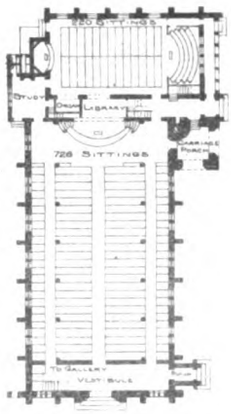

PLAN.

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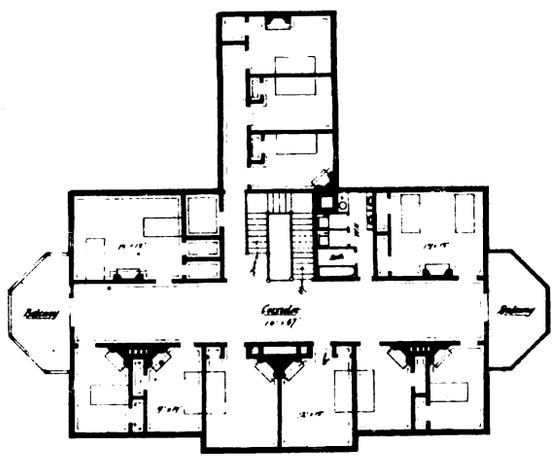
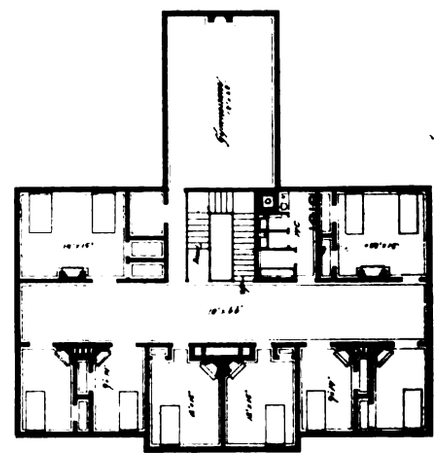


Second Floor Plan



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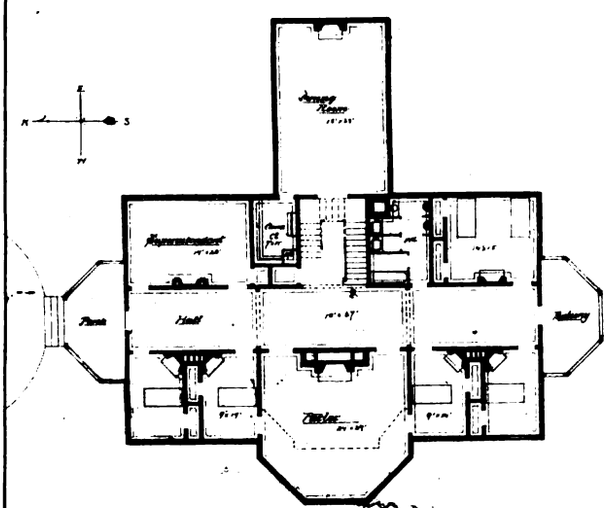
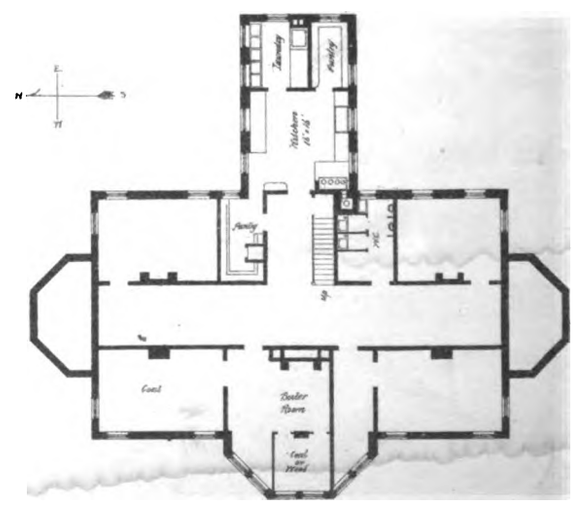


First Floor Plan of Hospital



Basement Plan

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Sketch for Adams Nervine Asylum

Cabot & Chandler Archts Boston

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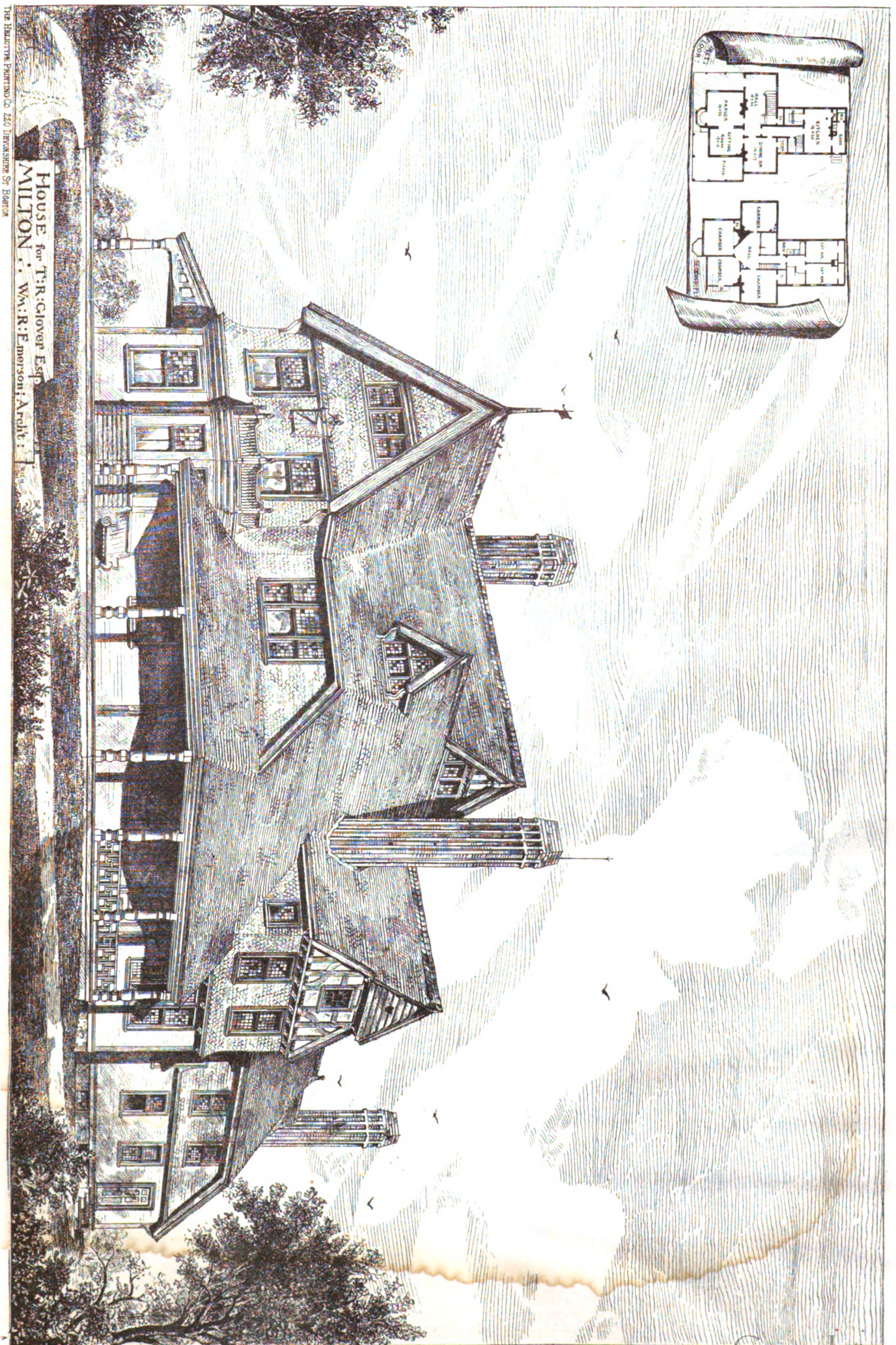

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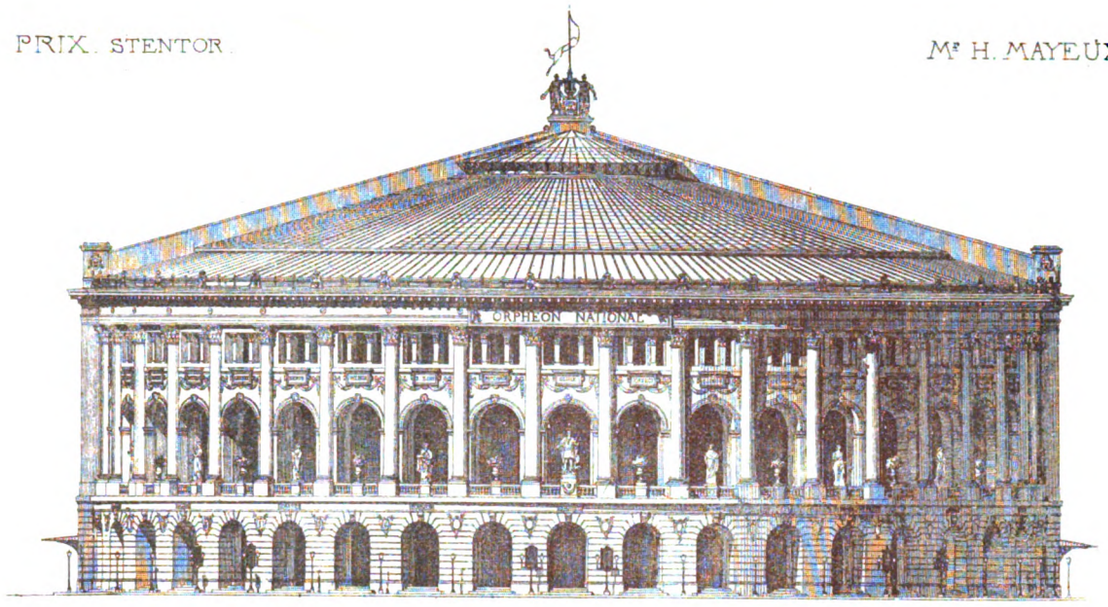
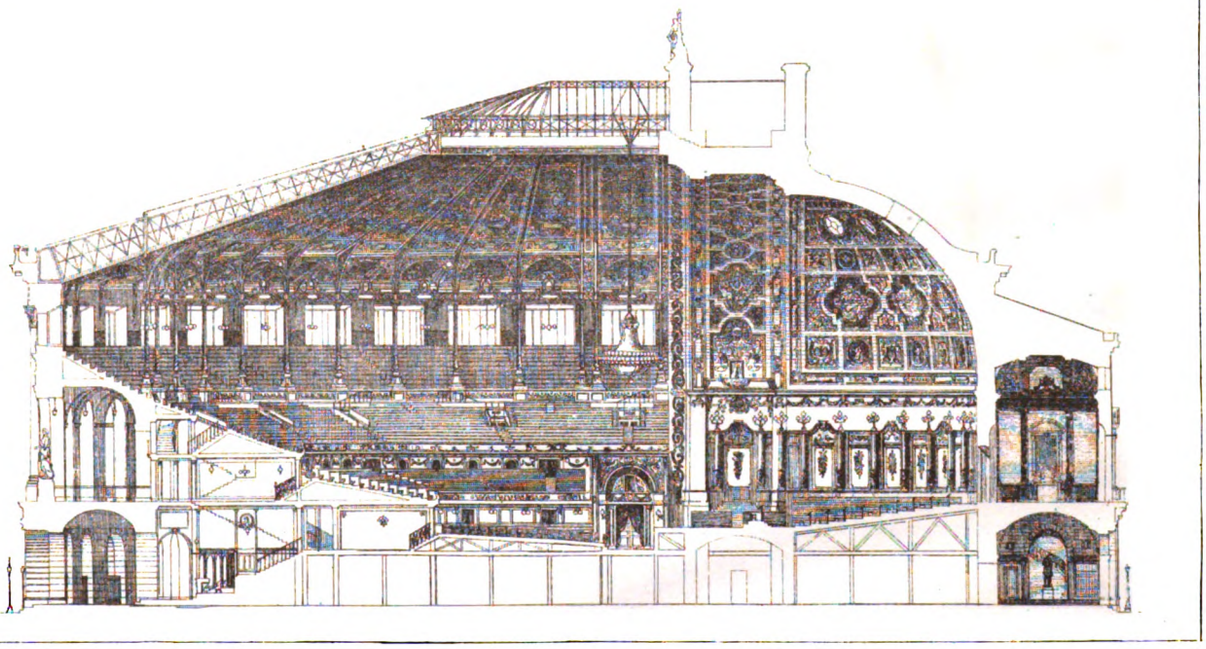
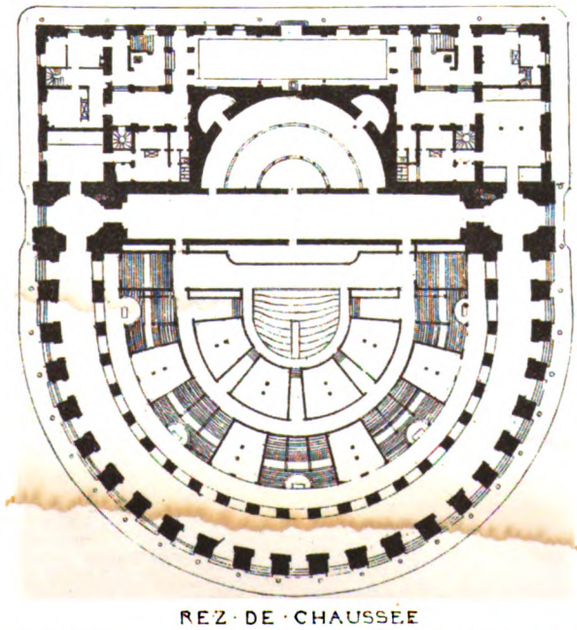
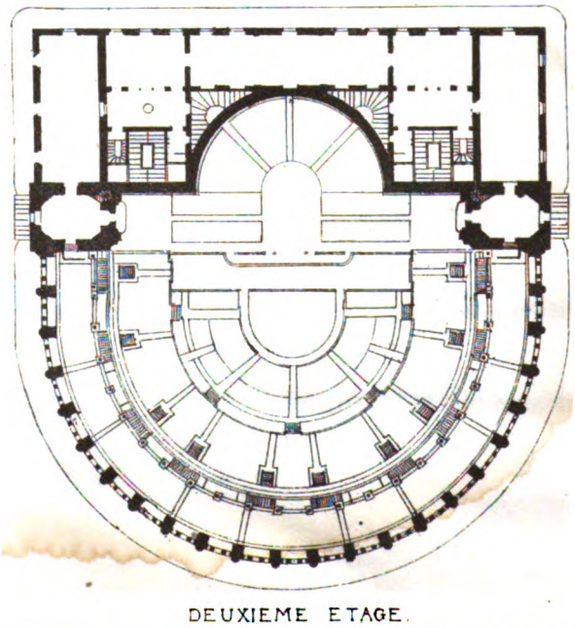






REZ-DE-CHAUSSEE



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DESIGN FOR AN ORPHÉON

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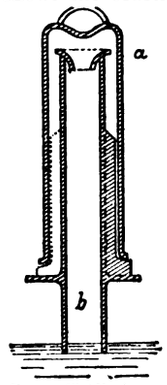
generally been costly and vastly comprehensive. So far as the drainage of great cities is concerned, there is much to be said in favor of their practice. There is much to be said, too, on the other side, and it has been ably said. My present purpose relates chiefly to the sewerage of villages and country towns having a considerable proportion of uncovered and unpaved area. There are hundreds of towns in this country which cannot afford the gigantic and costly work of introducing such a system of sewers as it is usual to find in a great city. Quite generally, when the question of their drainage arises, a city sewerage engineer is consulted, and a plan is prepared which remains unexecuted because of its excessive cost. By far the larger part of this cost is due to the fact that the proposed system contemplates the drainage of such sub-cellars as are rarely found in country towns, involving a depth that would probably never be needed, and the removal of the storm-water, which, after the area shall have become covered and paved, might flow off by the public sewers. It would be better, in the case of all rural towns, to disregard the question of storm-water entirely. This may be more safely and much more cheaply removed over the surface. The only reason for admitting it to the sewers would be to prevent injury to property, and, under the circumstances we are considering, the danger of this is not sufficient to justify the expense, nor is it sufficient, were there no question of expense, to justify the sanitary and economical disadvantages of providing for it by a system of large sewers. It is better to keep above ground, and to discharge by the natural means of outflow, all water which may be so disposed of without offense or danger to health, — that is, all or nearly all rain-fall. The extent to which the first flow over a paved road-way may properly be admitted to the sewers is a question to be decided according to the circumstances of each case. It is generally wiser to keep such road-ways clean by sweeping than to use the rain-fall as a scavenger.

What towns of the class under consideration need — and they need it very imperatively — is a perfect means for the removal of the foul wastes of households, factories, etc., and the draining of the subsoil, if this is springy or wet. They should only be called upon to spend the money necessary to secure these ends; and if they can learn to limit their demands to this absolute requirement, their sanitary improvement need no longer be the bugbear that it now is.

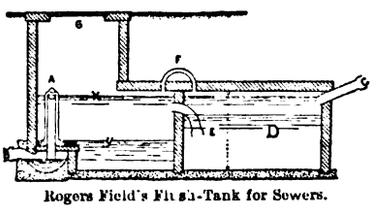
The advantages of small-pipe sewers have been sufficiently stated, except, perhaps, with reference to the single matter of ventilation. It is much easier and more simple to secure the needed change of the atmosphere of a small chamber than of a large one, and the usual means, which are but partially effective in the case of a large brick sewer, are ample for the complete ventilation of a small pipe. Hitherto the objection has held, in the case of pipe sewers of less than ten inches in diameter, that when they become obstructed it is a difficult and costly matter to clear them. But for this objection, there was no reason why six-inch sewers might not be used for all villages or parts of towns having a population of not more than one thousand; for a six-inch pipe laid even with a very slight inclination has ample capacity for the discharge of all the household waste of such a population.

We have now reached the point where there is no reason whatever to apprehend the obstruction of such a sewer by anything that can get into it through proper and properly arranged branch drains. Rogers Field's flush-tank, as arranged for the periodic flushing of such sewers, may be confidently relied on to keep them swept clean of everything that may enter them. The accompanying diagram shows the construction of the annular siphon which is the essential feature of this tank. A siphon of this form, four inches in diameter, comes into action with certainty under a stream of one tenth of a gallon per minute; so that a tank having a capacity of one hundred and fifty gallons, placed at the head of each branch sewer and fed by a stream which will fill it once in twenty-four hours, will give it a thorough and daily flushing, and keep it clear of all obstructions. No matter how limited the public water-supply may be, this small amount can always be spared for the work. Where there is no public supply and no available extrinsic source of flushing water, the sewage itself from a few of the upper houses along each lateral sewer may be collected in the tank and used for the flush.



Rogers Field's Annular Siphon.

This simple device has proved itself, both here and in England, to be entirely reliable and effective. It may safely be assumed that it has secured a reduction of the cost of the drainage of small towns to one half of what was formerly necessary.



Rogers Field's Flush-Tank for Sewers.

It has been held hitherto to be one of the advantages of sewerage that the imperfect joints or imperfect material of the sewers afford an outlet for superabundant soil water, and secure a valuable sub-soil drainage. It is coming to be understood that the same channels which admit soil water to the drain will admit drain water to the soil, robbing the sewers of the vehicle needed for the transportation of their more solid contents, and causing a dangerous pollution of the ground, of cellars, and of drinking-water wells. The foul-water sewers should be as absolutely tight as the best material and the best workmanship can make them, and the drainage of the ground should be effected by the use of agricultural drain tiles, constituting an entirely separate system, which, while they may for economy's sake generally occupy the same trenches with the sewers, should be carefully arranged to prevent sewage matters from entering them.

The question of sewage disposal is the great unanswered question of the day. We are familiar with the objections to the methods usual here. European countries, which have been forced by the density of their population to give especial attention to this subject, have as yet hardly got beyond the point of proving that there is no royal road to success, and that whatever theory may say on the subject, sewage not only has no value to the community producing it, but it cannot be got rid of except at considerable cost.

The only method thus far developed which is entitled to consideration here, aside from discharge into the sea or into a running stream, is purification by application to the soil, with or without the agricultural consideration. Whether by surface irrigation, by the use of sub surface absorption-drains, or by intermittent downward filtration, this method of its disposal, properly applied, is absolutely complete and satisfactory. The opinion has quite naturally prevailed that the severity of our winter climate debarred us from availing ourselves of it. The experience of the past severe winter has fully justified the opinion of those who have maintained that this objection is not a real one. In England the sewage-irrigation farms have taken charge of the effluent without interruption throughout a season of almost unexampled severity. At Berlin a like immunity has continued throughout the winter; and even at Dantzic, near the mouth of the Vistula, in a climate nearly as severe as that of St. Petersburg, and where provision was made for a direct discharge into the river during the winter season, the disposal by irrigation is said, to the surprise of all, to continue uninterrupted in the coldest weather.

At the Nursery and Child's Hospital on Staten Island, winter overtook us before our absorption-drains could be laid. The flush-tank which holds one day's sewage, was made to discharge over a low spot near the absorption-ground. Even in the coldest weather the entire outflow settled away into the earth before the next flood was delivered. Evidently the warmth of the sewage is in all cases sufficient for it to thaw its way into the ground. This is, without doubt, the explanation of the continued working of the shallow drains under my own lawn during nine consecutive winters, although at least once the ground was frozen to a depth of two and a half feet below them.

THE ILLUSTRATIONS.

DESIGN FOR AN ORPHÉON. — M. H. MAYEUX, ARCHITECT.

THIS illustration, which is reproduced from the Croquis d'Architecture, published by the Intime Club, is referred to in the article, American Dramatic Theatres, III., in this issue.

HOUSE FOR T. R. GLOVER, ESQ., MILTON, MASS. MR. W. R. EMERSON, ARCHITECT, BOSTON.

COMPETITIVE DESIGN FOR THE ADAMS NERVINE ASYLUM, DORCHESTER, MASS. MESSRS. CABOT & CHANDLER, ARCHITECTS, BOSTON.

DESIGN FOR THE BOUNDARY AVENUE PRESBYTERIAN CHURCH, BALTIMORE, MD. MESSRS. J. A. & W. T. WILSON, ARCHITECTS.

It was proposed to build the chapel during the coming spring. The materials were to be Amherst or Berea sandstone, rock-faced window finish, etc., tooled. Capitals, and other carved work, Indiana limestone. Jamb-shafts and cloister-porch columns of polished granite. Height of ridge of roof from ground, 66 feet. Tower, 180 feet. Extreme dimensions of church and chapel, 60 by 150 feet.

CORRESPONDENCE.

THE ENVOIS DE ROME.

PARIS, July 7, 1879.

THE annual exposition at the École des Beaux-Arts of the work of the students in the French Academy at Rome has just closed. The work is very excellent this year, rather better it seems than usual, and especially has this been remarked in the architectural studies. One of the daily papers asserts that the *envois* of this year are better than any that have been sent back from Rome since the time when Charles Garnier was a *pensionnaire* of the government. Surely they show a wonderful amount of careful, conscientious study, and excellent, spirited drawing. M. Loviot, in his fourth year as *grand prix* student of architecture, sends some very interesting studies for a restauration of the Parthenon at Athens. Unfortunately he must have been *en charrette*, as they say in the studios, for neither the section nor the plate of details is washed, each being simply drawn in ink with the shadows outlined in pencil. However, this gives one an opportunity to observe what care the best of the French architects take in making their drawings, and though their strongest point lies perhaps in the use of the brush, still, as in this case, they put a great deal of spirit into a simple outlined drawing.

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The polychromy of M. Loviot's restauration is quite notable. The shafts of the columns are of a plain terra-cotta color, but the capitals and the entire entablature are covered with brilliant colors, forming a very striking contrast to the simplicity of the architecture and yet not in discord with it, serving rather to unite the grave spirit of the Doric to the animation and vigorous life of the figures in the pediments and metopes. The triglyphs and the tympanum of the pediment are colored a deep transparent blue, represented by a strong wash of the pigment Prussian blue. All the rest of the entablature is of a bright crimson, nearly a carmine, relieved on the principal mouldings by ornaments in strong blues and yellows. The entire length of the architrave is hung with golden shields placed in the axes of the metopes. Between these are Greek inscriptions, while a graceful running ornament in blue and yellow still further subdues the strong red ground. One striking feature is the introduction of mural paintings, covering both the exterior and the interior walls of the cella, and adding not a little to the finished look of the whole restauration. On either side of the entrance is a fierce battle scene, occupying the entire height of the wall. Inside is represented a naval attack, — perhaps the siege of Troy. The paintings are in full color, but very subdued and quiet in tone, notwithstanding the fierce action depicted.

M. Loviot disposes of the question of the lighting of the interior by leaving the centre entirely open, the roof running straight up to the line of the inner two-storied colonnade, so that the colossal statue of Minerva has nothing above her but the open air and the blue sky.

Accompanying these drawings is a very pleasing water-color sketch of the Parthenon as it now exists, a good example of a sketch which, while thoroughly architectural, still takes account of the play of light and shade and beauties of color which make up what a painter styles a work of art.

Hardly less interesting, though not showing the same amount of original talent, is the work of M. Paulin, in his third year. This gentleman is evidently a hard worker, for he has not confined himself to one building nor to one locality. He sends a carefully colored drawing of an elaborate altar-piece in rich mosaic-work from the Church of Or San Michale, at Florence. Also an elevation of the Hospital at Pistola, a very plain building, except for a high frieze band above the loggia arches representing apparently scenes from the history of the hospital. M. Paulin's best studies, however, are of the Temple of Theseus, at Athens. He shows India-ink drawings of its present condition, with carefully detailed studies of the construction, and a very brilliantly colored restauration of the whole temple. The general color of the stone is a strong terra-cotta ; the walls of the cella are of a bright, vivid carmine. He seems to have used the pigment pure, and as thick as it would work with the brush. This is not relieved at all, except by a narrow edging at the corners and a low dado, both of a dark green tone. The shafts, capitals, and architrave are entirely bare. The metopes and tympanum of the pediment are of the same vivid carmine, while the triglyphs are represented of an intense blue, obtained by using pure Prussian blue. The corona and a few of the smaller mouldings only are ornamented with these same colors, blue and red. The dragons at the corners of the pediments are a dark brown, with blue wings and red crest. The general effect of this coloring is very striking, and is anything but the "snowy, glistening Pentelic marble, set off against the blue sky of sunny Athens," the ideal of the early restorers of the Greek temples. M. Paulin shows a great deal of skill in handling such vivid colors without making the result either harsh or glaring.

M. Blondel, in his second year, has some mural paintings and some studies from the Soldiers' Camp at Pompeii ; also, studies of the entablature of the Temple of Vespasian, at Rome, shaded in India-ink to the last degree of perfection. His studies of the tomb of Cardinal Sforza, in the Church of Santa Maria del Popolo at Rome, are better, and as drawings are very satisfactory. They are colored in a monotint of a light greenish hue, the shades of the statues being put in with pencil, and the effect of the whole monument is indicated so naturally and easily that it commends itself to one's attention much more than many of the elaborate, overworked drawings sent back by so many of the students during their first two years at Rome. Of this last sort is the work of M. Nénot, in his first year, — some studies at Pompeii and of the Temple of Vesta at Tivoli. The drawings are made with the greatest care, and are almost photographic in their exact observance of light and shade, but they all have the same fault. They are overworked, and they make the execution of the drawing of more importance than what is drawn, which is evidently not the true aim for an architectural drawing.

One of the sculptures has attracted a great deal of attention. It is the work of M. Lanson, in his second year, a group representing the story of Judith and Holofernes, nobly conceived and worked out with wonderful correctness and fidelity to nature, while at the same time it is full of freedom and original thought. Indeed a daily paper seems to think that it has given the group the highest possible praise when it styles it as having altogether escaped the enthralling effects of the teaching at the Beaux-Arts. Holofernes, a powerful, muscular man, is stretched out in a deep slumber on a couch ; before him is Judith, sword in hand, but her face turned from the sleeper, and bearing a questioning, hesitating look, as though she doubted whether the deed should be accomplished. The right hand of Holofernes, stretched out from the couch, is a perfect *chef-d'œuvre*, marvellous in its anatomical details. No less skilful is the arrangement of the drapery hanging in loose, simple folds from the left shoulder and waist of Judith.

Beside this piece is the work of M. Cordonnier, in his first year, — Salome bearing the head of John the Baptist : a very excellent study of the nude, a very graceful, pleasing figure, but in sentiment rather a study than an independent work of art, and lacking the appreciation of art feeling which is so manifest in M. Lanson's work. The rest of the sculpture seems inferior in quality, perhaps because under the shadow of Judith, but more probably from lack of real independent talent, and from a too close adherence to academic canons. One little bit, however, by M. Roty, is a real gem. It is a study for a medallion, representing art applied to industry. One face represents Minerva and Vulcan bending over a piece of armor, Vulcan leaning on his sledge-hammer, while the goddess traces a design on the steel. The other face represents a single figure seated on an anvil and drawing upon a shield in her hand. It is but an *ébauche*, but the figures are very clear and sharp cut, almost Greek in spirit, and showing a very fine taste.

The exhibition of painting is rather a disappointment. The fourth year student, M. Besnard, from whom most would be expected, sends an immense canvas, over which he evidently tried to spread himself, and he did it. "After an Invasion," it is called: a throng of fugitives pouring out from the smoking city, followed by the ruthless conquerors in full armor; on the right a dead hero being borne away on a rich bier, followed by mourning companions in arms; in the centre a group formed around a tree, to which is suspended another dead leader ; for background a weird, sulphurous effect of sunset ; and a black, smoky sky over all. The picture is not lacking in dramatic effect, and has many good points, but it is hardly what might be expected from a fourth year *grand prix*.

More attractive is the work of M. Chartrau, in his first year, consisting of an excellent study of the nude, a "*Jeunèsse de Mondore*," — an Oriental maiden playing on a sort of guitar; and a strong, vigorous study from the antique, in charcoal, — the Borghese Faun, — a masterly drawing, freely, easily indicated, nothing like the painfully stippled work one so often meets with. He also contributes a very neat, spirited pencil-drawing of Del Sarto's Madonna of the Sack at Florence.

C. H. B.

BUILDERS' PRICE-BOOKS.[1]

Architects who read the English professional journals with any attention, are generally struck by the important part played in building operations on the other side of the water by price-books and schedules of quantities. For even the smallest piece of construction it seems to be thought necessary to employ a surveyor to take out the quantities, and judging from the large sale of price-books, the English mechanics seem unwilling to trust their own memory as to the cost of the several items.

With all these precautions, one would imagine that bidding would be a mere form. Where a quantity surveyor, paid half as much as the architect himself, supplies to each competitor a schedule of work and materials, detailed to the minutest particular, and the books give him the cost to a fraction of a penny of matching a board, or dovetailing a baluster, it would seem that the process of estimating reduced itself to a mere matter of multiplication and addition, and one would expect the proposals to vary by a few shillings at most, so that it is rather startling to find the bids for ordinary structures, as reported in the current news, often varying by fifty per cent or more, the difference being, we should judge, quite as great as that generally found between the estimates of intelligent builders in this country, made from the drawings alone, without any assistance from quantity surveyors or books of prices.

Some attempts have been made to introduce the practice of supplying quantities on this side of the water, but it is very doubtful whether architects derive any benefit from the custom. To persuade a client to spend as much on surveyors' fees as he does for the contract drawings and specifications is a difficult task, and yet contractors who have once had quantities supplied sometimes continue to demand them as a right, to the great annoyance of the architect, whose duty and interest both forbid his incurring such responsibilities to the contractor, and of the owner, who supposed that the architect took care of everything except paying the bills. Nor does it seem that builders themselves need encourage the practice, if, as it seems, many of the best English contractors find it better to do their own measuring from the plans, without regard to the lithographed quantities furnished by the surveyor.

For price-books more may be said, but the system of discounts is so complex that they can be nothing more than a guide to the probable cost of new or unusual modes of work. We fancy that separate books for each individual builder, varying by a large percentage according to his standing on the Commercial Agency register, would more accurately represent the true mode of estimating; and the common habit here among contractors of keeping an account with every building, to show it sactual cost, is far more useful in practice. However, both architects and builders will often find them serviceable for the information they give about approximate cost, and the incidental hints which many of them contain as to the proper execution of various kinds of work.

[1] *Bevis's Builders' Price-Book*, for Architects, Engineers, Surveyors, Builders and Contractors, and Guide for Estimater. London. 1879.

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The book before us is far inferior in these respects to the well-known Laxton's Price Book. Although much smaller, a considerable portion is devoted to thinly disguised advertisements of patented articles, and some of the information scattered through the text, such as the observations that "the cost of wrought-iron is greater than that of cast," or "the best materials in painters' work are cheapest in the end," might be very much condensed without loss. However, it is often of advantage to be able to refer to a book of the kind, and in default of any American work more modern than the antiquated little book of Clough, which dates back to 1850 or thereabouts, the English publications might well meet with a considerable sale on this side. It is worth noting that the average English prices approach so closely to ours that an experienced builder estimates that almost any structure could be contracted for here for the sum found by multiplying the quantities by the prices given in Laxton.

AMES'S ALPHABETS.[1]

THERE is, just at present, a promising field for a good book of examples of lettering for various uses, — one which shall represent in an available form the practice of the best modern draughtsmen, who have in this, as in other branches of art, made rapid advances within the last few years. If such a book could be easily procured, we should soon see the mass of sign-painters and letterers following in the path already entered upon by some of the more artistic and enterprising, who, however, are obliged in many cases to have their work designed for them by architectural draughtsmen, these being more familiar with the sources of good design, or to invent them themselves, with greater or less success, for want of a sufficient variety of good and appropriate designs.

The book before us, far from showing an advance in the right direction, is inferior to many already in existence. The styles of lettering given are not only antiquated and commonplace, but poorly drawn for the most part, although some pages of monograms, and rich though awkward initial letters, show that it is not skill which is wanting on the part of the author, so much as knowledge, and the taste which comes of the attentive study of good examples. As it is, however, the marble worker who would like to improve his style of cutting inscriptions, the sign-painter who is desirous of imitating some of the beautiful work already to be seen in the streets of our large cities, or the architect who is ambitious to give his plans the air of those made by the best French and English draughtsmen, will look for assistance to this book in vain. Perhaps the author may some time be disposed to try again. If so, we can encourage him to hope that by careful and discriminating study he may be able to produce something far better, and, we hope, much more popular than this work is ever likely to be. Let him procure some large photographs of the arches of Titus and Constantine at Rome, with one of the tomb of Scipio, and such other classic inscriptions as may be easily obtained, with a few numbers of the Croquis d'Architecture, and such covers of modern French and German novels as he can pick up. These will give him some idea of style in plain lettering, and any type-founder's specimen book, particularly that of Bruce & Son, of New York, will supply him with varieties for any emergency. Then, if he will make careful copies of mediæval initial letters as reproduced in the works of Delamotte and others, referring to "Modern Painters" for explanations of the moral significance of the various flourishes, he will begin to comprehend how much he has yet to learn.

Let him, in addition, study the lettering of Moyr Smith and Maurice B. Adams in the *Building News*, and make himself master of the system of round hand introduced by Messrs. Keuffel & Esser, of New York, and he will then be qualified to be of some use to the average draughtsman. If he is still ambitious to instruct in topographical drawing or heraldry, he will have much to learn on those subjects also. In the page of the present work which is devoted to such matters, we find, among representations of "heaths," "rice plantations," "fresh water marshes," etc., of which we speak with modesty, never having heard of or seen such things before, some indications of orchards and pine woods which are, though perhaps not without precedent, different from those usually accepted, and in the meagre array of representations of heraldic tinctures, the gold (not "yellow") is represented precisely like the black, only somewhat lighter, both being shown with white vertical and horizontal lines on a black ground; a very poor substitute for the crossing black lines and the dotted white ground which stand for *sable* and *or* all the world over.

[1] *Ames's Alphabets* for Architects, Engineers, Engravers, Artists, Sign Painters, and Others. New York: Bicknell & Comstock. 1879.

SLOW-BURNING CONSTRUCTION.

BOSTON, July 24, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — In reply to your remarks of July 12th on the inexpediency of protecting wood with wire lath and plaster, I must beg to differ absolutely.

Of course I am well aware of the danger of imbedding the ends of timbers closely in brick and mortar walls. In the most thorough mill construction the timbers rest on an iron plate, having an iron rib projecting from its upper side, fitting into a groove on the under side of the beam, thus tying the walls together. An air-space of about half an inch is left around the beam for ventilation, and the upper corner of the timber is rounded so that if it is burned or broken it will roll out without pulling down the wall. This is a common but not a universal practice. I lately inspected a railroad station in this vicinity, of considerable architectural pretension, in which timbers 12 inches by 12 were being laid solid and square, in brick walls banked up with earth on the outside. I had a friendly conference with the master mechanic of the corporation, who could find no objection to this method, and politely intimated that I was a theorist whose ideas were of little value to practical men. I replied that the only method of instruction for theorists was in studying the work of good practical mechanics, and that I should have another interview with him when he came to put in new timbers in place of rotten ones in about three years' time.

In respect to the question of covering timbers with metal, or with wire lath and plaster, to protect them from fire, and for other purposes, I will cite some examples: —

The ends of the open timber trusses of Dr. Bellows's church in New York were, as I am informed, protected by "iron shoes closely fitted," the effect of which was to cause dry-rot to begin at the ends, and to extend seven feet into the unprotected part of the timber.

The timbers of a mill roof which the owner covered with sheet-iron in 1872, plastering upon the under side of the roof boards between the timbers, are now completely rotten, and are being removed at heavy expense.

I append a letter from the Superintendent of the Mason & Hamlin Organ Company to prove the good condition of timbers protected in 1874 with wire lath and plaster. This gentleman has kindly examined his building to see if there was any ground for your excepting. You and your friends are cordially invited to examine the two wings of the building of the company, constructed in 1874 in accordance with the plans of this insurance company. The only change we should now make would be to advise the use of automatic sprinklers in place of perforated pipes.

We can find many older examples of beams thus protected and in sound condition, if this example is not sufficient.

I would also call your attention to the removal of wooden posts in many of the buildings constructed after the fire in Chicago, in which the compression of the "close-fitting" metal caps and steps had caused dry-rot to occur. Also to the very common practice of laying mill floors in mortar, which has prevailed more especially in Rhode Island for about forty years, and is still continued by some builders. In other mills tarred paper is used, as the mortar is apt to cause dust to sift through cracks to the injury of the machinery. These floors are not in very dry condition, as they are often scrubbed, and the atmosphere of a mill is purposely kept moist. I can direct you to very many sound floors thus laid more than twenty years old.

Our experience, therefore, leads us to the conviction that a coat of good lime mortar, even on three sides of a heavy beam that is covered on the top by a water-tight, double floor, will not cause dry-rot, provided the ends of such timbers are *not* enclosed in a "close-fitting metal shoe," and not imbedded in a mortar wall without an air-space at each end.

In respect to open-timber construction I merely mean to say that the mill constructor adapted a very ancient method to modern use long before the architect had seen reason to do so. E. A.

MANUFACTORY OF THE MASON & HAMLIN ORGAN CO.,
162 BROADWAY, CAMBRIDGEPORT, July 23, 1879.

E. A., PRESIDENT:

Dear Sir, — Your communication of the 17th inst. was duly received and acknowledged, but we have deferred answering upon the subject matter of the letter until we could make a careful examination of portions of our timbers in person. The original building erected by us at this place was built in 1870, and the additions to this one on each side were built in 1874. It is to these latter portions we refer in this report, as the timbers here are covered with the wire lath on three sides and plastered, the lath held off about three eighths of an inch by strips of wood nailed to the timbers. These timbers are laid into the side walls at their ends and secured by a flat iron dog to hold them to the wall.

At your request we have uncovered portions of these timbers, pulling off the plastering and wire lath in about a dozen places in different parts of the buildings, and we find the timbers where we have examined in a good state of preservation. The wood is discolored where the mortar or plastering has touched it, and is toughened by the contact; but one corner of one of the timbers which was sappy and most likely to decay was as sound as any part.

We examined the ends of the timbers in the walls, and found these also in a sound and live condition. We also found that there was in most cases a crack about the ends of these timbers, allowing the air to circulate about them.

The places that are uncovered we will leave as they are for a short time, that you may have them examined by any parties, and we shall be pleased to have you refer to or examine our buildings at any time.

Respectfully yours, MASON & HAMLIN ORGAN CO.,
(Signed.) by W. O. TROWBRIDGE.

STEAM OR HOT-WATER HEATING.

NORFOLK, VA., July 19, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — Will you, or some of your readers competent in such matters answer for me a few questions in the house-warming department, and greatly oblige.

As a mode of house-warming (dwellings), in general terms, which

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is preferable, — all other things being equal, — steam or hot-water? Which the more expensive — as to first outlay, through time, and amount of fuel consumed?

What are the advantages of either over the other? What the disadvantages and objections to either over other?

Please answer in one of your early issues and oblige,

Yours truly, etc., An Amateur Subscriber.

NOTES OF EXPERIENCE AND INEXPERIENCE.

Autogenic Soldering. — Autogenic soldering consists in applying the edges of the two pieces of metal to be joined together, and melting the seam by the flame of the oxyhydrogen blowpipe. Reviewer.

31. Sewage in the Irrigation System. — What becomes of the sewage of houses, in the "irrigation system" proposed by Mr. Waring, during the winter and early spring? This question was asked by Zero two or three years ago, and the answer was that the system had "worked successfully for several years." But can any one give particulars?

M. P.

NOTES AND CLIPPINGS.

Mechanic's Lien. — Judge Gresham, of the United States District Court of Indiana, has just decided that where a contractor furnishes material for the building of a number of houses of the same character, the same material being used in each house, the contractor may take a lien on each house separately for the material furnished, although the material may have been furnished in bulk and in gross for them all, and does not have to prove the identical material in each house, and specifically prove each and every article furnished to each house separately.

The Decoration of St. Paul's. — The *Academy* states that Mr. Heath Wilson and Mr. Pullan have forwarded to London from Florence their design for the decoration of the cupola of St. Paul's. The design is a voluntary contribution toward the solution of the problem of the interior decoration of the cathedral.

Widening of London Bridge. — In the recent speech made by the Lord Chancellor, in the House of Lords, in favor of the proposals for widening London Bridge, one of the arguments made use of was that the same thing had been done successfully in Florence. There is, however, no parallel between these two cases, as a correspondent in Florence points out in a forcible manner. "In the first place," he writes, "any comparison between the magnificent edifice, London Bridge, and the paltry Ponte alle Grazie at Florence, is utterly absurd. The first is one of the finest bridges in the world, thrown over a deep and wide river, is a triumph of engineering skill, and is built of costly materials; the second, a commonplace, shabby structure, crosses a torrent — the Arno — which for most part of the year is not a yard deep below its arches, which were therefore easily built, and it is of ordinary hammer-dressed rubble. Before it was widened it was one of the most incommodious and dangerous bridges for passengers existing in any great city, and it was a matter of absolute necessity to remedy these defects. The Ponte alle Grazie has been widened by cast-iron archways, the abutments of which are the triangular spurs on each side of the piers of the old bridge; the stone arches are semicircular, the iron ones are elliptical, and the combination of the two is about as ugly in point of design as may be conceived. But the old bridge has no architectural beauty whatever, and its additional disfigurement is little cared for in presence of the fact that it has been made a safe and commodious bridge. If, to widen that most beautiful bridge in Italy, the Ponte alla Trinità, by Ammanati, the Municipality of Florence had suggested a plan resembling that adopted in the case of their plain old bridge of the Grazie, they would have been denounced as vandals all over Europe, and such a proposal would have constituted a case really resembling the proposed widening of London Bridge, so far as the question of taste is concerned. To impair the beauty of any great work of art is a national disgrace and a public calamity. I do not sufficiently remember the bridges on the Rhone or at Paris, also quoted by the Lord Chancellor, but if these instances in any way resemble that selected from Florence, they must tell equally against his argument. He must adduce cases in which the commodious widening of bridges has been attained without injury to the original design, the design being at the same time as beautiful as that of London Bridge. To quote the successful and ugly widening of a plain, old bridge in support of that of one of the noblest bridges in the world, by means calculated to impair its beauty, is objectionable, for there is no end to the mischief which might be done were such a statement allowed to have any weight." — *The Academy.*

Welding Cast-Iron. — The Chinese process of welding cracked iron wares by cementing them with molten iron is thus described: In the case, for example, of a cast-iron pan requiring such treatment, the operator commences by breaking the edges of the fracture slightly with a hammer, so as to enlarge the fissures, after which the fractured parts are placed and held in their natural positions by means of wooden braces; the pan being ready, crucibles made of clay are laid in charcoal and ignited in a small portable sheet-iron furnace, with bellows working horizontally. As soon as the pieces of cast-iron with which the crucibles were charged are fused, it is poured on a layer of partly charred husk of rough rice, previously spread on a thickly doubled cloth, the object of this being to prevent the sudden cooling and hardening of the liquid metal. While in the liquid state, it is quickly conveyed to the fractured part under the vessel and forced with a jerk into the enlarged fissures, while a paper rubber is passed over the obtruding liquid inside of the vessel, making a neat, strong, substantial, and in every respect thorough operation.

The Hotel de Ville. — The Hôtel de Ville in Paris, the old seat of the Municipal Government, which was destroyed in 1871, is far advanced in rebuilding, and will be completed in 1881, at a total cost of about $4,400,000.

The Chæronean Lion. — A paragraph in the newspapers states that the Hellenic Archæological Society have resolved to restore the colossal lion erected by the Thebans on the field of Chæronea over the Sacred Band and others of their countrymen who fell fighting against Philip, in B. C. 338, and which it is related bore no inscription "because the gods had willed that their fortune should not be equal to their prowess." Through some unknown cause the lion became embedded within a tumulus, remaining there until 1818, and consequently no mention of it is to be found in the descriptions of travellers who visited Chæronea in the early part of the century. When the people discovered it they imagined that treasures were concealed inside it, and it was consequently broken into pieces by a chief. But for the sake of the credit of the Greeks it should be mentioned that according to another account the statue was originally made up of several pieces of marble, which separated owing to the weight of the earth in the tumulus. The body is hollow, and it was supposed that the lion formed part of a fountain; but such a use must have been impossible, as the head of the lion is solid. Herr Hettner, in describing the statue, says: "How moving the speech of this dumb monument, of this form so powerful, haughty, and noble! We see that the lion, if he cannot conquer, is heroic even in his fall. He has lain down faint to death with the conflict, the tail drawn close to his body; but still he gathers once more his sinking forces and raises himself, with fierce defiance, on his forepaws. In vain! His eye droops in death. The corners of his mouth open for a loud cry of pain, but he resists with a firm compression of his lips; there shall be heard from him no complaining sound." Nearly forty years since Colonel Mure said the condition of the monument was a proof of how little the regeneration of Greece has done for that of her monuments, and it does not speak much for the patriotism of the descendants of the Hellenes to find such a memorial lying in a ditch in fragments. Even now it is not certain that the restoration will ever be carried out. The world by this time knows the difference between Grecian "resolutions" and Grecian actions. — *The Architect.*

The Torlonia Museum. — In this Lungara Torlonia Museum is a great treasure of erudition as well as art, which has been collected with tranquil silence, critical care, and patient study during the course of at least thirty years. Year after year the prince has summoned about him remarkable men, among whom Baron Visconti, nephew of the great Ennio Quirino Visconti, whose memory is closely associated with the fine sculpture-galleries of Rome and Paris, has been the most intimate confidante of his projects, acquisitions, and decisions. Each new statue, bust, or bas-relief has been examined with the most scrupulous and critical eyes; also compared with ancient medals and coins, and passages from ancient and modern writers. Of these important meetings careful journals of proceedings have been constantly made. Thus a valuable æsthetical and artistic unpublished literature has collected about those Lungara Halls. When a statue was found in fragments, it was carefully put together. An accomplished sculptor, an expert in his art, Professor Guaccarini, has devoted his entire professional life to the work of the museum, aided by the councils of the prince and his learned assistants. One of the most remarkable groups of the collection — Hercules and Telephus — when found at Porto was in almost unrecognizable little fragments. Baron Visconti, who was present at the excavation, and who knew the history of that suburb of Ostia, recognized the bits as belonging to a valuable work of art. Others thought not; but the workmen were obliged by an imperious command of the baron to gather the small pieces carefully together and put them in a large basket which the persistent archæologist took away with him in his own carriage. Two weeks after, these fragments were sufficiently united to prove the truth of Visconti's assertion, his well-practised artistic eyes were not likely to be at fault. Through Baron Visconti's patience and Guaccarini's skill the group was afterwards restored to its present complete state, and offers to us a specimen of antique art most curious in form and development, and which in justice ought to be known to the future visitors to the museum as the École Visconti. — *Blackwood.*

A Usurer's Trick. — A rather sad story is now engaging the attention of the Scottish law courts. A M. Le Conte, who has been engaged by the Association for Promoting the fine Arts in Edinburgh as an engraver, accumulated during the last forty years a vast number of rare and valuable prints. The collection, it appears, was sought after by a money-lender, who once upon a time was also an engraver. Le Conte unluckily was indebted to him for about 12*l.*, and by means of a decree the whole of the engravings and the furniture were seized. It was alleged in court that "instead of making a proper inventory and valuation, the sheriff officer wilfully put a false and absurdly low value upon said valuable property; and, in order to disguise and conceal the false and fictitious nature of the valuation, he illegally and wrongfully slumped a vast number of articles into a very few lots, with the result of bringing out a total valuation of 12*l.* 4*s.* 1*d.* On May 23 a pretended sale of said articles in slump to the defender, at the sum of 12*l.* 4*s.* 1*d.*, was made; or at all events, the sheriff officer, who had two assistants in the sale, declared said articles to belong to the defender, as at that value, in payment and satisfaction of his alleged debt of 12*l.* of principal, with 4*s.* 1*d.* of expenses." Le Conte seeks the restoration of all the articles taken from him, or payment for them and 300*l.* by way of damages. The case seems more like romance than reality. In old days we believe sheriffs' officers were accustomed to make short work of appraisals, but it is different now. The judgment of the court has not been given, and when it is it may be against the unhappy engraver. But however we may look at the affair, it is pitiable to find an artist losing all his treasures, and, as he declares, left destitute of a home because he could not pay 12*l.* 4*s.* 1*d.* It is also rather novel to find an instance of a money-lender with æsthetic proclivities who is eager to secure engravings for his own enjoyment. — *The Architect.*

Comparative Strength of Wood and Iron. — Heim finds that, in most cases, a uniform strength of structure can be more economically secured by the use of wood than by the use of iron. The strength of wood is proportioned to its density, and can be increased by its immersion for two or three days, or until complete saturation, in linseed oil, kept at a temperature of from 150° to 212° F. — *Fortschr. der Zeit.*

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THE incidents connected with the building of the city and county buildings at Chicago have been so various and, from a professional point of view, so suggestive and entertaining from the beginning that we have been compelled to refer to them in these columns much more frequently than perhaps is warranted by the intrinsic importance of the buildings themselves. The jealous and active unofficial supervision of disappointed bidders is still bearing fruit. The latest phase is the report of the expert committee appointed to consider the charges preferred against the material and construction of the city-hall. General McDowell was chairman of this committee. As regards the ashlar of the building they find that an average of every sixth stone is in some respect imperfect and at variance with the requirements of the contract, and that one in every twenty-one stones is marked by some distinctly bad defect. The committee, however, state their belief that these defects will not cause the destruction of the building in the near future, but that none of them are "excusable in good building nor warranted by any terms or any fair construction of the contracts and specifications." They find that the brickwork, though not according to contract in all respects, is fair; that the granite course is deficient in width of bed; and that the bond-stones required by the drawings, and distinguished by color thereon, do not exist in the wall; that these deficiencies in the stone-work, amounting to 6,666 cubic feet, have necessitated extra brickwork, in the backing amounting to one hundred and fifty thousand brick, which stand as a claim against the city; that the superintendent, instead of being the director and arbiter of the work, has had his plans changed and his orders countermanded by "some higher power." The building committee of the city council, after a discussion of this report, determined to call in additional evidence before reporting to the council, and have summoned a large number of people who have been immediately or remotely connected with the work from the beginning. Apparently, therefore, it will be long before we discover what power it was through which the stone which the builders should have rejected has become the head-stone of the corner.

MEANWHILE, making due allowance for the tendency among all experts to justify their employment in any case by over-scrupulous exactions, and by interpretations of contracts more literal than is found expedient or practicable in the actual fulfilment thereof, there seems to be sufficient ground to believe that the work has not been carried out in accordance with the obvious stipulations of the contract in some particulars. Thus a point in defence is unofficially made with regard to the absence of bond-stones by stating that although the drawings distinctly set forth their number, position, and dimensions, due mention of them was accidentally omitted in the specifications, and that as the "specifications are made out last," they are to govern in preference to plans. This may possibly be true in cases where plans and specifications differ, but it certainly is a new interpretation of common building agreements that a stipulation which is required by the drawings but not by the specifications is not to be considered binding by the party of the second part. In practice the specifications are in no sense bills of quantities, and their function is never to take the place of drawings or to supersede them, but to state the obligations which cannot, from the nature of the case, be defined by drawings. No building contract can be intelligible and binding in which the plans and specifications, having been duly identified by signatures, are not equally essential parts thereof.

THE main building of the Centennial Exhibition has for some time been held by the Permanent Exhibition Company of Philadelphia, under a license granted by the Commissioners of Fairmount Park. In the midst of innumerable discouragements, moral and pecuniary, this company, by various means, has succeeded in gathering together and maintaining what promises to be a very large and important collection of objects illustrating the progress of the industrial and mechanic arts. Among their devices for raising money they have seen fit to hold in the building exhibitions and entertainments of various kinds in order to attract the public. But the Commissioners, impelled either by a want of confidence in the success or usefulness of the undertaking, or in its management, or by a desire to restore the park to its more legitimate uses, have from time to time had consultations with the officers of the society with a view to the removal of their enterprise to some other locality. Notwithstanding these warnings the notice served last week upon the society to quit the premises, remove the building, and restore the site within two years, according to a provision reserved in the license, has come with a certain suddenness and surprise. This removal will have the effect of opening the park and giving due prominence to the Memorial Hall, which is now destined to remain the only visible record of the great international event of 1876. As for the Permanent Exhibition we cannot but think that, if it was really on a fair road to success and is in good hands, a great and wealthy community like Philadelphia will scarcely permit it to die. Certainly Fairmount Park is too distant from the city for the location of a great museum the object of which is to educate and encourage a popular taste for the mechanic and higher arts, and to illustrate by visible signs the great social movements of the day. If the building itself is to be reërected elsewhere it is to be hoped that its temporary and shed-like character, which was only condoned by its enormous extent and by a certain agreeable architectural effect obtained by repetition of parts, may be modified so that an institution designed to do service in the cause of civilization may be more monumentally and safely housed.

TWO weeks ago we had occasion to refer to the fact that the demolition of the water-front of the Ducal Palace at Venice, preparatory to the rebuilding of it, had actually begun, and that London Bridge was in imminent danger of such alterations as would materially change its familiar aspect. Now we have to record the fact that a still greater historical monument has been doomed to absolute destruction. A short time since a committee of the French Chamber of Deputies, charged with considering the plans for the rebuilding of the Tuileries, approved the restoration of the central palace in its original exterior form "out of respect to the genius of two great French architects, Philibert Delorme and Jean Bullant." But a few days afterwards — on the 29th of July — the Assembly, terrified by the spectre of a monarchical restoration, determined to sacrifice art to politics, and, by a vote of 249 to 166, adopted the proposal of M. Proust, to destroy the ruins of the famous pile and turn the site, which it has occupied for more than three centuries, into a garden. We cannot contemplate the final demolition of the palace of the Tuileries, with all its thronging historical and artistic associations, without a pang of regret. Doubtless this monument has exercised over the civic architecture of the Renaissance in Western Europe and America an influence more potent than any other single structure of the style. Without the inspiration and suggestions furnished by this fruitful source the aspect of modern cities, especially in this country, would have been essentially different. Jean Bullant, Pierre Lescot, Claude Perrault, Percier and Fontaine, Visconti and Lefuel, extended the order of the Tuileries and developed their capacities in the façades of the Louvre, which are the type of the modern French Renaissance; and this form of art is the basis of design in the great majority of modern architectural façades. If the central

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monument of this great style is indeed to be removed from its site, and is to share the fate of De Lorme's other works, — the Château Gaillon and the Château Anet, demolished in the revolution, with all their sculptures of Jean Goujon and Germain Pilon, — may we not hope that at least some characteristic portion of it may somewhere be preserved, as, in the court-yard of the School of Fine Arts at Paris, Gaillon and Anet have been preserved to keep alive an affectionate respect for the work of the great master, and the knowledge of a beautiful phase in the development of art.

The old churches of London which gradually have been left stranded upon an alien shore of shops and warehouses, deserted of worshippers, but supporting each a clergyman and a clerk and still maintaining an empty form of ecclesiastical existence without any practical service of religion, are daily falling under the operations of an act called the Union of Benefices Act. Under this act the ecclesiastical commissioners are empowered at their discretion to destroy these old and disused buildings and to sell their valuable sites for as much money as they can get for them, equitably apportioning the charitable endowments of the disestablished churches to neighboring and deserving charities, and making large grants for church-building purposes in outlying districts, where the potential congregations are large and the existing church accommodations insufficient. All this seems as unsentimental and, from an archæological point of view, barbarous, as from a practical point of view it is judicious and expedient. The architects who are fortunate enough to build new churches with these spoils of the old churches have no reason to complain; but the destruction of the ancient landmarks is deplorable, and the Society for the Protection of Ancient Buildings is kept in a continual state of vigilant expectation and vigorous protest by the thorough manner in which the work of spoliation is done. Among those lately destroyed are St. Mary Somerset, established in the reign of Edward III., and rebuilt with a tower by Wren, after the great fire; St. Dionis Backchurch, dedicated to St. Dionysius the Areopagite, the St. Denis of France, dating from the thirteenth century, and rebuilt with a tower by Wren, after the fire in 1674; St. Benet's or Benedict's, in Grace Church Street, another of poor Wren's churches, with a cupola and spire 140 feet high; St. Mildred's, another of Wren's monuments; St. Martin's Outwich, a fourteenth century building in mediæval style, rebuilt by Cockerell; St. Antholin, a church of the twelfth century, rebuilt by Wren in 1684, with an oval dome supported by eight columns, a miracle of carpentry, and with a tower 154 feet high; St. Michaels, Queenhithe, built by Wren in 1677, with a spire; All Hallows, Bread Street, where Milton was baptized; All Hallows Staining in Mark Lane, where Queen Bess, before she was queen, performed her devotions after her liberation from the Tower; and now there is a struggle between the society and the commissioners over St. Mary-at-Hill, Eastcheap, with the chances in favor ultimately of the latter. The old steeples cannot stand in the midst of the modern torrent of business, and hereafter those who would be instructed by their example must content themselves with the counterfeit presentment in books. But if the work of Queen Anne's time is destroyed in one part of London it is rebuilt in another part in a fashion more archæological than architectural.

In view of the rapid disappearance of these old London churches built upon mediæval foundations and replacing mediæval forms after the sharp line of demarcation between the historical eras afforded by the great fire of London, it is well for us to pause and reflect upon the really important part which they have played in the development of the characteristic forms of English Renaissance. Perhaps the unequalled opportunity enjoyed by Sir Christopher in the fifty or more city churches which he built conferred upon this style an undue share of his own personality in the beginning; but in the hands of Hawksmoor, the Adamses, Sir William Chambers, Sir John Vanbrugh, and the rest of his successors, it became acclimated and distinctly representative of English genius. A scientific analysis of these forms, as distinguished from those which were developed on the other side of the Channel after Delorme, Bullant, Lescot, and the other French masters, would betray an elasticity in the five orders of architecture which it has been the fashion distinctly to deny during the prevalence of the late Gothic revival. The elements of the orders are so simple, and their proportions and details so arbitrary, that at first sight it would seem but little scope is left in them for expressions of characteristic individuality. But the comparison which we have suggested seems to be capable of proving pretty distinctly that in due course of time, out of the accumulation and succession of minute and more or less indistinguishable traits of personality, which may be expressed through this apparently inelastic medium of arbitrary signs, there was presently developed an expression of national genius which, if it is difficult to define, is easy to recognize. We cannot but think that a study of the use of the orders and of the classical details in these old London steeples, because of the absence of embarrassing practical conditions in such merely ornamented features, would go far to show how this national genius unconsciously, modified the accepted types of form, until, if not a new language, certainly a new dialect was developed. We know that even now, so powerful is the influence of national genius, notwithstanding the cosmopolitan nature of architectural education in these days, it is impossible for an English architect to produce a work in French Renaissance without betraying his foreign accent. In like manner the French Renaissance, as quoted in our own state-houses and city-halls, though often grammatically correct, is after all only broken French, or rather a French modification of our own vernacular. Thus we believe these old steeples have a lesson to teach, and the architectural philologist who shall be able to point out in them the characteristic and national modifications of detail and combination may also be able to show how these modifications are expressions of essential traits of national genius. The distinction between the use of the orders by the Greeks and by the Romans has been traced to its sources and found to have clear relations to the national genius in each case. Doubtless the more complicated civilization of more modern times will not prevent a similar analysis.

Mr. James Jackson Jarves, in his last letter to the New York *Times* from Florence, explains the conditions under which the proposed "Retrospective Art Exhibition" is to be held in that city. This is to include all those objects which are generally understood to be proper in "loan exhibitions." A scheme, therefore, to bring together the household treasures of such a province as Tuscany, with such untold and unknown stores of wealth in every department of art, and of art manufacture, hitherto hidden away and inaccessible, must be of no little promise. It has been sanctioned and assisted by the Italian king, who has placed the Pitti Palace at the disposal of the committee for this purpose, and the date of opening is dependent solely upon the promptness with which the necessary funds can be gathered and the preliminary arrangements made. As regards the application of art to manufactures of every kind in stuffs, glass, furniture, bronzes, and metallic work of all sorts, in pottery, porcelain, ivories, terra-cotta, jewelry, etc., this exhibition must needs be of the utmost interest and importance. But while we are congratulating ourselves upon this intelligent enterprise, by which the ancient Tuscan households and galleries are for a time to give up their precious heirlooms for the delight and instruction of the world, most inconsistently there exists under the auspices of the very Italian government which fosters this undertaking a system of barbarous and arbitrary destruction of works of art and archæology which seems incredible. It is said to be the fixed policy of this government, in disposing of the results of the excavations which it is now carrying on in various parts of Italy, to retain only two or three specimens of any class of objects recovered, for the enrichment of its museums, and to destroy all duplicates. Thus it is known that in the excavations at Pompeii there are imperative orders from Rome, enforced by heavy penalties, to melt down all bronzes and metallic objects, and to break up all terra-cottas and sculpture, however beautiful and valuable, after selecting two or three specimens of each for the museum at Naples. One witness states that he saw more than four hundred bronzes melted under this official vandalism, so that Naples might have a more unique collection and be more attractive for students of archæology. Such a policy of barbarism surely seems more Turkish than Italian.

AMERICAN DRAMATIC THEATRES. IV.

The practical difficulties of the Greek type of auditorium, as given in the last article, have led to the adoption of a second class of forms, varying in plan from the segment of a circle, or the flat curve of an ellipse, to an elongated horseshoe shape. In these the main floor, commonly known as the pit, orchestra-stalls, or parquet, has a rise to each seat of from two and one half to six inches; and there are added one or more galleries, the upper one often extending back over the entrances, and not unusually having a seating capacity equal to a third of the house. In most cases the galleries extend at the sides

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to the proscenium wall. In foreign theatres they are often shallow and divided into small boxes, seating six or more each, but this disposition has not found favor with American audiences, who prefer a more open and democratic arrangement. This preference has led to making the galleries unusually and inconveniently deep, eleven or twelve rows of seats often being placed across the rear, the number being reduced to three or four at the ends. In order to get sight lines for this awkward arrangement the gallery front often has a tall or slope towards the proscenium, which not only gives a bad combination of lines in the house, but makes the seats nearest the stage extremely uncomfortable by causing them to slope from side to side. However much Americans may incline to abuse their own spines they do not relish an enforced twist, especially when they are bent on pleasure. Of course this tilting of the seats may be avoided by stepping the gallery in its length as well as width; but this interferes with the use of the ordinary connected tilting-seats, causes stumbling places, and much increases the expense. To obviate the bad effect of the sloping lines of the gallery front, the ceiling and dome have sometimes been built on the same pitch, but the effect is not agreeable, and the work of construction is complicated and the cost increased. How this form came into vogue in America is uncertain; but it is not unlikely that it may have been a makeshift of the carpenter-architect, who saw no other way to crowd the required number of seats demanded by the manager into the limited space allowed. There are a few foreign examples of this arrangement, — the Alexandra Theatre of St. Petersburg being one of the most important, — but it certainly has little to encourage imitation.

The desire for undue seating capacity in the hall has been one prolific source of controversy between owner or manager and architect. The limits of safety and comfort being determined, there is almost invariably a demand for extra seats and more standing-room. To what extremes the architect should be made the antagonist of his employer, and constitute himself a martyr for the benefit of the many, is still an open question. It would seem reasonable, if he is to be considered the natural guardian of public safety, that he should be paid something for such service out of the public purse, or at least should be reimbursed for the sacrifice of his commission, and attendant law expenses, when forced to such loss for the good of the community.

As is well known, the law, as made for and applied to the safe building of theatres, is very defective. Even were the restrictions of the buildings acts more perfect, the administration of them has generally been incapable and ineffective. It is within the knowledge of any one who cares to investigate, that a prominent and important building of this class, in Boston, was passed as safe, after daily supervision by the department of survey and inspection of buildings, and was subsequently made somewhat safer at the demand of the public and through the intervention of other authority; and that, in less than a year, under the pressure of public opinion, stimulated by the lesson of a great disaster, it was pronounced by the same department *unsafe*, and the owner forced into an additional expenditure of many thousand dollars in order to make it safe. The record of other cities seems to be no better.

The limit of the seating capacity of a theatre, in its relation to size of site, and width, and disposition of exits, should be established by law. And the law should be sufficiently comprehensive, and administered with an amount of recognized and experienced ability, to meet the constantly varying conditions of arrangement of parts in relation to stairways, lobbies, character of audience, and other modifying circumstances, and on such matters the administration should have the weight of competent judgment.

The building act of Boston provides no special and exact rules for theatres. They are classed in general with churches and other public buildings, from which they differ very materially. The act does not even prescribe that *all* doors shall open outward. Certain discretionary powers are delegated to the inspector of buildings, an official whose tenure of office is uncertain, and whose compensation is entirely inadequate to insure the requisite experience and ability for the exercise of large discretion in matters so technical and important. The clause of the act requiring plans and specifications to be submitted to the inspector insures safety only so far as the examining authority shall be fully conversant with the questions at issue.

On the width of exits, a prominent English theatre architect, presumed to represent a somewhat advanced standard at the time, wrote some eight years ago that staircases of exit should be four feet in width for any number not exceeding one hundred persons, with an additional foot in width for each additional hundred, and good landings every ten steps and no winders.

A still later authority requires one foot to every one hundred people. These measurements to be at the narrowest points, which govern the whole. The proposed building act for the city of Providence, R. I. (which failed of adoption by the legislature chiefly on account of the opposition of mechanics and others interested in speculative building, although earnestly advocated by the able architects who prepared it), prescribed, with other good rules for safety, that no egress or exit stairway of such a building should be "less than five feet wide, nor aggregate a less proportion than eighteen inches for each one hundred of its inmates or spectators that such room may at any time contain." This would give twenty-two feet six inches width of exit for fifteen hundred persons, which might answer if all other conditions of safety were fulfilled, but is too narrow a limit to cover all cases. The wording of the restriction is wise, in that it includes the audience that the *room may at any time contain*, which would comprise the occupants of standing-room, an additional number very closely figured by the manager, but often disregarded by the authorities.

With fifteen hundred people seated, many halls are made to hold one thousand more standing, and it is on special and holiday nights, when this jam is most likely to occur, that there is the greatest danger of panic from various causes.

There should be as strict a law against overcrowding a place of public assembly as against overcrowding a steamboat. In a conspicuous place in each division of a theatre there should be placarded the exact number it is allowed to contain, and to sell tickets in excess of this limit should be a serious offence against the law.

It should not be permitted anywhere to build a theatre on the second floor above the street, and no ordinary hall for public assemblies should be permitted more than one flight above the street.

It has been previously noted that the open gallery is more popular here than any arrangement of boxes, although proscenium-boxes, which are comparatively worthless as positions from which to view the stage, are often introduced for the convenience of the management, for the use of those who care more to be seen than to see, and as decorative features of the proscenium.

The curves of the gallery or parquet circle fronts are important matters of appearance and use, but changing so continually with the varying conditions of the size and shape of the hall, that it is difficult to lay down any rules for them. The old, elongated, horseshoe form has nearly fallen into disuse, it being serviceable only in very large auditoriums or where boxes are substituted for open galleries. The division of parts is another uncertain and variable factor. In the new English theatres the front of the parquet is occupied by very roomy seats, called the orchestra-stalls, the rest of the space being seated more closely and named the pit. The seats in the stalls sell for ten shillings and in the pit for two, although the front ones of the latter are in as good position as the rear ones of the former. The stalls are reached by going up stairs to the balcony and then down two stairways, three feet wide each, located next the proscenium. These must prove dangerous exits. There is in addition a gate through the pit railing, to be used in case of emergency; such special exits are of little avail. People naturally seek to get out where they came in, and all exits to be serviceable should be in constant use as entrances, or at least open and in full view of such entrances.

The favorite division in most American theatres is into orchestra-stalls, or parquet, which includes the space formerly known as the pit, but now considered the choicest part of the house; the parquet circle, that is, the portion of first floor under the gallery; the first gallery, divided into balcony seats, which usually include the front two rows; and the family or dress circle, which includes the rest. If there is a second gallery it generally goes by that name. The present tendency is to abandon the second gallery or to reduce its capacity to a minimum. It is the experience in small cities and large towns that the "gallery gods," when corralled by themselves, are a source of greater disturbance than when in closer proximity to the better part of the audience. Good manners are contagious as well as bad. In some of the smaller buildings the parquet circle is omitted altogether, in order to sell more seats at a higher price under the name of orchestra-stalls.

In arranging the seating of galleries there is little difficulty in the central portions opposite the stage. The less depth there is to the hall and the more there is to the galleries the sharper the pitch must be to obtain good sight lines. Too steep a pitch to the gallery seats is both awkward to look at and disagreeable to the occupants. In some cases this has been carried to such an extent as to be dangerous to the persons going to their seats. But the chief trouble lies in reconciling the back corner seats with those of the ends of the rows towards the stage. In the horseshoe form this is very difficult, and led doubtless to sloping the lines of the gallery front towards the stage. In the flatter, segmental, or elliptical curves it becomes of less importance. Perfect sight lines for all gallery seats are almost impracticable where the rows are extended to the proscenium. By perfect sight lines is meant a full view of the entire stage floor, and of the scene for its whole height, from any seat in the hall, assuming the spectators to be of average height when seated (of course exceptional cases can be provided for only in the Greek form of sitting); this standard would require that from any rear corner in the gallery a view of the full width of stage at the footlights should be had over the heads of all persons in the front row coming between such sight point and the footlight line. Such perfect provision for seeing is very rare in theatres. It can be had by stopping the galleries short of the proscenium and flattening the curve considerably, as done by the writer in the new Lewiston Music Hall. Such a change is a move in the direction of freedom from precedent that promises good practical results.

The objection to it has been the supposed architectural necessity for breaking the side walls by the lines of gallery fronts and supporting columns. The old style (adopted from the French, where it had the boxes for an excuse) introduces a circular screen of columns surmounted by a dome within the hall, and interposes this screen between a part of the audience and the stage, shutting them out also from a view of a large portion of the decorative features. The new disposition starts dome or ceiling from the side walls, throwing the

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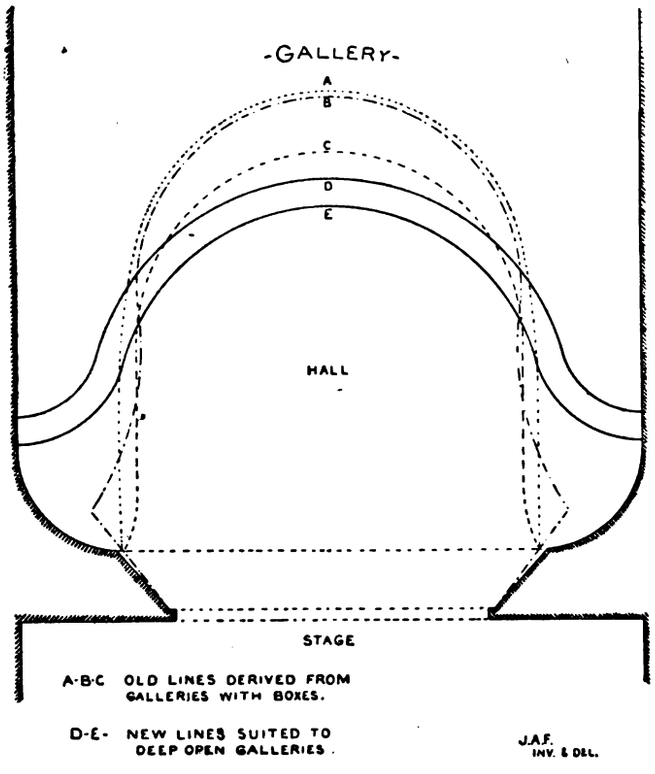
audience together and in full view of all parts of the house, and adopts the best treatment of the exposed walls consistent with their



real use. Following out the same idea, the proscenium wall, or the wing walls which cut off the useless corners next the stage, are treated as screens, and, where they are not required, without boxes.

J. A. F.

THE ILLUSTRATIONS.

THE NEW NATURAL HISTORY MUSEUM, SOUTH KENSINGTON, LONDON, ENGLAND. MR. ALFRED WATERHOUSE, ARCHITECT.

THE Index Museum, of which we copy from the *Builder* the interior, is the great entrance-hall of the new Natural History Museum in Cromwell-road, South Kensington. It occupies the centre of the building, and runs north and south. At the south end is the principal entrance, and at the north end the grand stair up to the first floor. Along the sides are deep bays, to be used as exhibition spaces, and above these are galleries which lead from the staircase at the north end to the foot of what is practically its continuation at the south end. Here the hall is spanned by a gigantic elliptical arch, carrying the staircase, which rises right and left until it reaches the summit of the arch, whence a single flight leads to the second-floor level. At each break of the balustrade, both here and at the north end of the hall, is a pedestal to carry a statue. The hall is entirely faced with buff terra-cotta, relieved by bands of gray. The mouldings of the arches, string-courses, etc., are enriched with a profusion of foliage, and much interest is awakened by the introduction of flowers, birds, and monkeys, which can be seen in the view we present to our readers. The floor is of marble mosaic. The roof is carried by wrought-iron semicircular lattice-girders, with conventional foliage inserted into the triangular spaces between the struts. A range of roof-lights runs on either side from end to end of the hall, while the flat centre of the ceiling has been decorated with a series of illustrations of plant-life on a blue ground. A general view of the new Natural History Museum was given in the *Builder* for the 4th of January, 1873, and a plan in the number for the 11th of January of the same year, together with a descriptive account. Additional particulars were given in its volumes for 1876 (p. 120) and 1878 (pp. 83 and 635). The building has been erected from the designs and under the superintendence of Mr. Waterhouse, A. R. A. Messrs. G. Baker & Sons are the general contractors. The terra-cotta has been supplied by Messrs. Gibbs & Canning of Tamworth.

THE HARVARD CHURCH, BROOKLINE, MASS. MR. E. T. POTTER, ARCHITECT, NEW YORK.

The stone-work of this church, which was completed several years ago, is Longmeadow-stone, relieved with a finish of a lighter stone.

COMPETITIVE DESIGN FOR THE FEARING LIBRARY, HINGHAM, MASS. MR. C. S. LUCE, ARCHITECT, BOSTON.

THE CONSTRUCTION OF MILL ROOFS.—A VIEW OF A ONE-STORY WEAVING MILL.

Our correspondent E. A. kindly furnishes us with these illustrations of the method of mill-building which he advocates. Of the diagram showing the construction of the roof he says:—

"The most common failure to meet the requirements of the Boston Manufacturers' Mutual Fire Insurance Company happens in respect to roofs. In our judgment the best and safest roof is one constructed of two and one half or three inch plank, covered outside with any of the approved compounds or with metal. The apparently excessive thickness of the plank is essential to safety, as there is always a better chance to save property before a roof is burned through than after; it is also essential to the stability of the covering, whatever it may be; it serves to keep the upper room warm in winter and cool in summer, and it checks or prevents the condensation of moisture on the inside. It may also be added that there is more reason for strength in roof construction as the weight of wet snow one foot deep is about double the weight per square foot of surface of the looms, stock, and operatives, as usually placed on a weaving-room floor. Attention is called to the open cornice with the ends of the beams constituting the brackets. A boxed cornice of wood is a common, unsightly, and useless cause of danger. No gutters are required."

Of the one-story mill, to which he refers in another column, he says:—

"The mill is rather more expensive than a mill having an equal amount of floor space built in three stories. Such a mill would be about 28 feet by 52 feet on each floor. The difference in expense of the building, however, would be more than made up in the advantages gained in the one-story mill. The first cost of the one story mill would be a little more, on account of the amount of roofing and foundations. The difference in cost, however, would probably be made up in a large mill, because in a one-story building all the labor of raising materials to the upper stories would be saved. The great advantage of the one-story mill is in having a more solid floor than can be had in any other mill above the first floor. Some of the machines weighing four or five tons have their greatest motion some distance above the floor, thus causing great vibration of the floor, so that the floor must be very solid. The advantage in the greater amount of light in the one-story mill is especially to be noticed in this mill, as the parts of the machines which used to be lighted are somewhat underneath and shaded from the light by the upper parts of the machine, so that the light ought to be stronger than can be got from side windows above. In the knitting-machines a strong light is necessary for arranging the needles. The handling of the work in the one-story mill can be much more conveniently done. In the old mill the work is done in passing the material from below to the top. The work is begun in the basement and the goods are finished at the top, then they all must be sent down again. In the new mill all this may be saved. This mill was built for a particular purpose, the parts of the stockings being made in the old mill, and put together in the new one. The overseeing is less necessary in the new mill. In the old form of mill an overseer is needed for each floor; in the new one only one overseer is needed. The heating of the building is made much easier, as, the amount of window space being larger, the sun has more effect in heating the room. In this mill only three steam pipes are necessary, around the walls; the number which would usually be put in is four. The gain in light is so much that the gas is lighted one half hour later every day."

The mill here shown is 85 feet by 52. The flooring is supported on transverse girders 12 inches by 14, ten feet on centres, and between each pair of girders is a joist 6 inches by 14, running parallel with them. Girders and joists are supported on dwarf walls. The roof is framed as shown in the diagram, the rafters being also 12 inches by 14 and ten feet on centres,—their upper ends being supported by columns rising from the floor below.

CORRESPONDENCE.

THE CHICAGO CITY-HALL INVESTIGATION.

CHICAGO, July, 1879.

THE construction of the new city-hall is now the subject of an "investigation," the occasion for which is twofold. In the first place it must be borne in mind that last spring witnessed a political change in the government of the city. A Democratic mayor and council succeeded a Republican mayor and council. A Democratic building committee succeeded a Republican building committee. Mr. Chesbrough, Republican Commissioner of Public Works, was succeeded by Mr. Waller, a Democrat. Mr. L. D. Cleaveland, who has been three years Superintendent of Buildings, was succeeded by Mr. Kirkland. Both of the latter are architects by profession. Mr. Cleaveland, by virtue of a clause in the ordinance creating a department of buildings, which required the superintendent to "perform such other services as might be required," had been compelled by the last mayor to virtually become the architect of the city-hall without additional compensation. Mr. Kirkland also succeeds him in the performance of these functions.

Beside the usual new broom business there is a labor trouble. The Stone-Cutters' Union of this city is an eight-hour league. The contractors for stone-work refused to accede to the eight-hour plan, and employed outside parties to work ten hours. The Union struck. The contractors then employed men to cut the stone at Bedford, in addition to such as they might obtain in the city. The striking stone-cutters had plenty of leisure to look about the building, and this sug-

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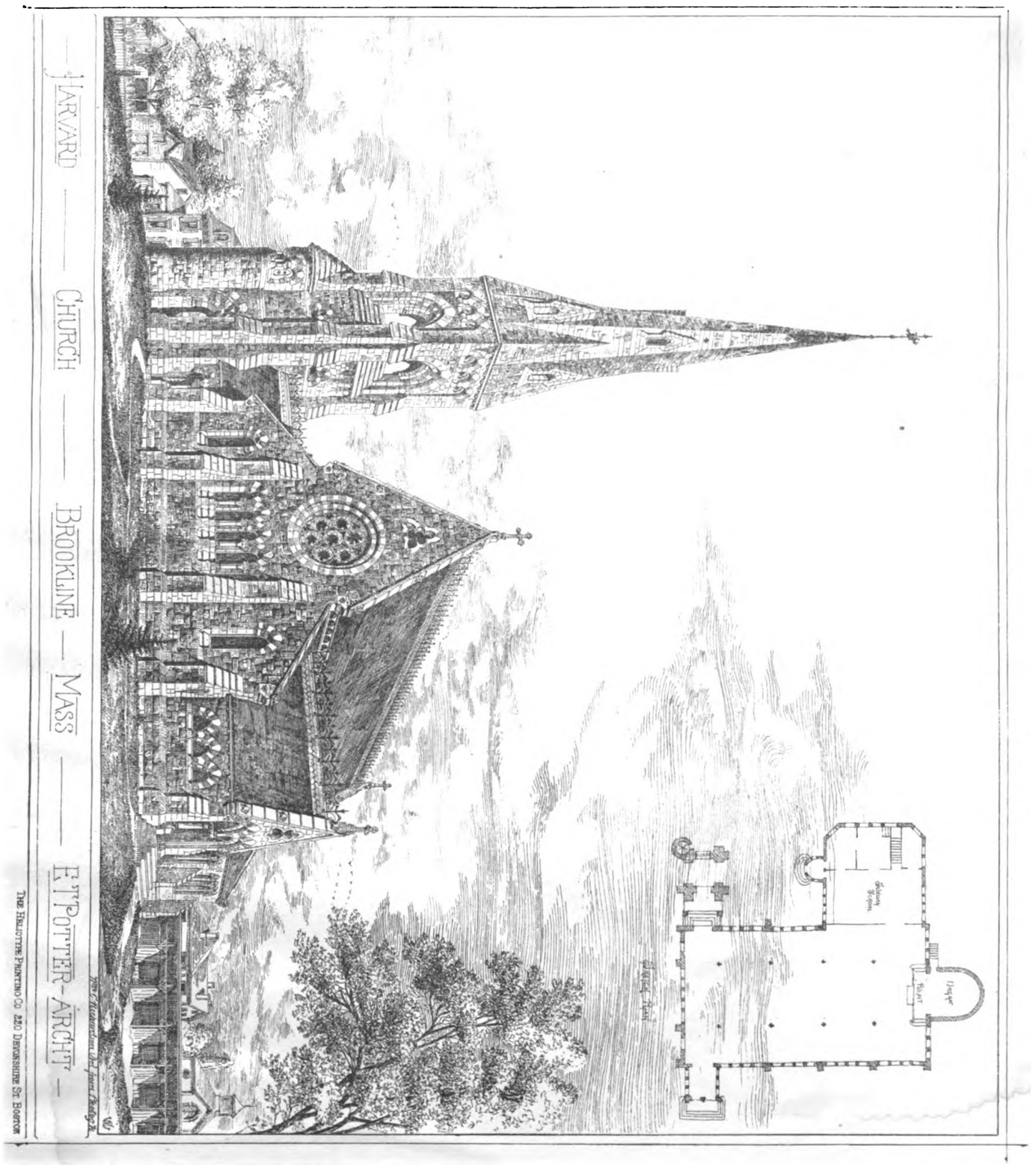

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DESIGN FOR
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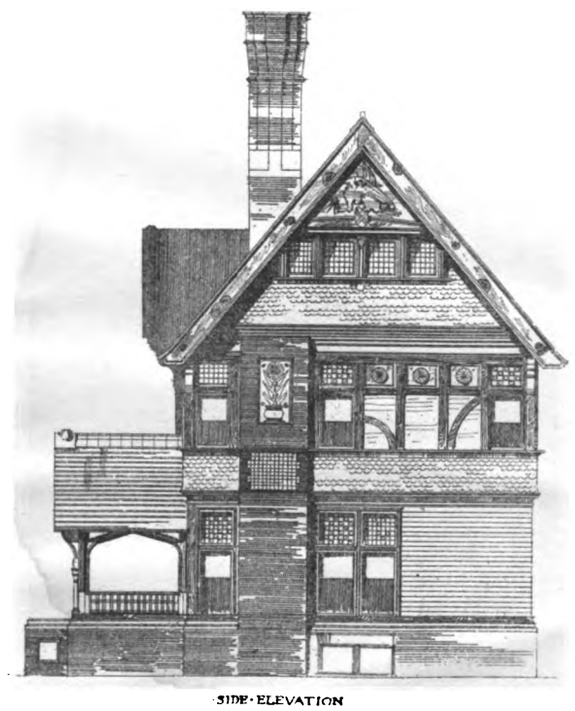
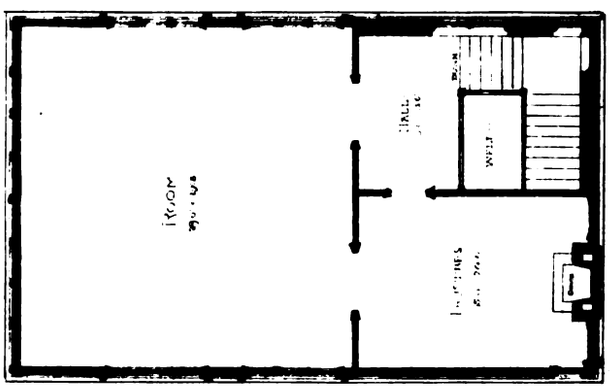
·ARCHITECT·
·BOSTON·

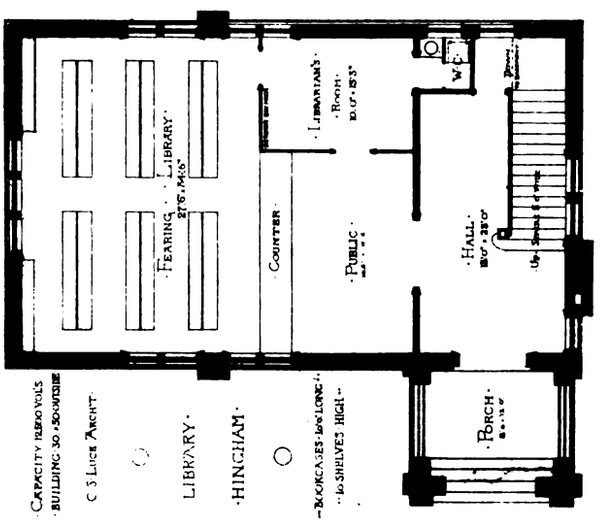
·FRONT·ELEVATION·



·SIDE·ELEVATION



·PLAN·OF·SECOND·STORY·



PLAN·OF·FIRST·STORY·

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

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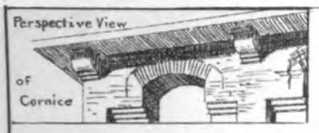
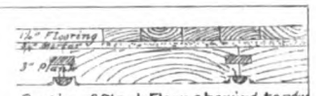
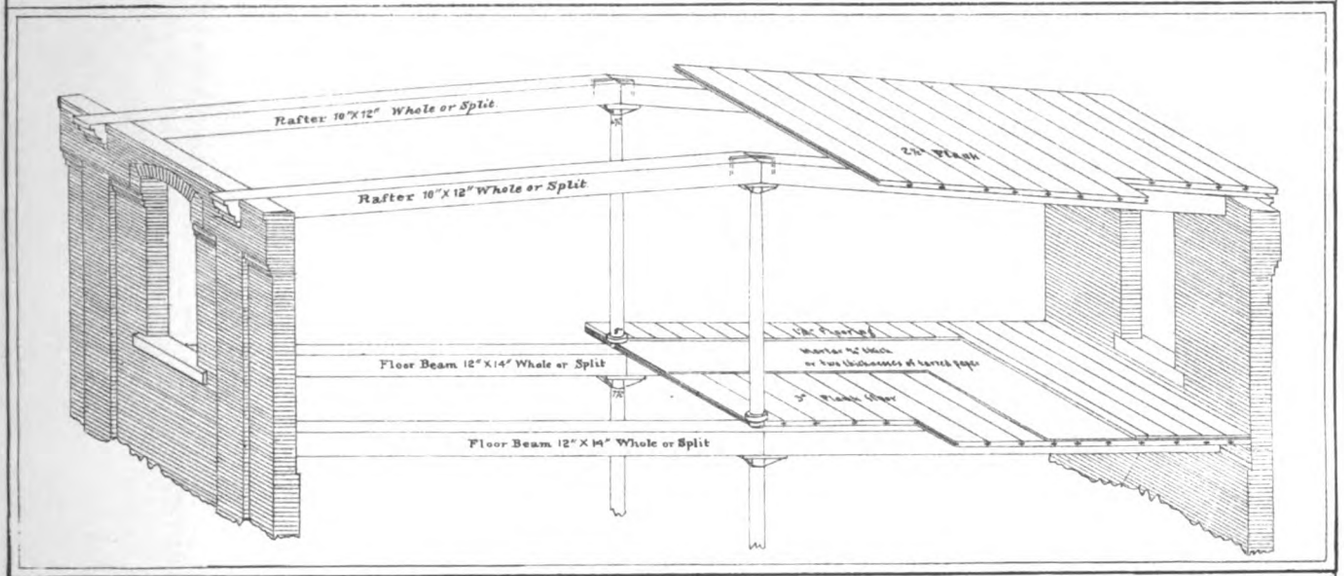


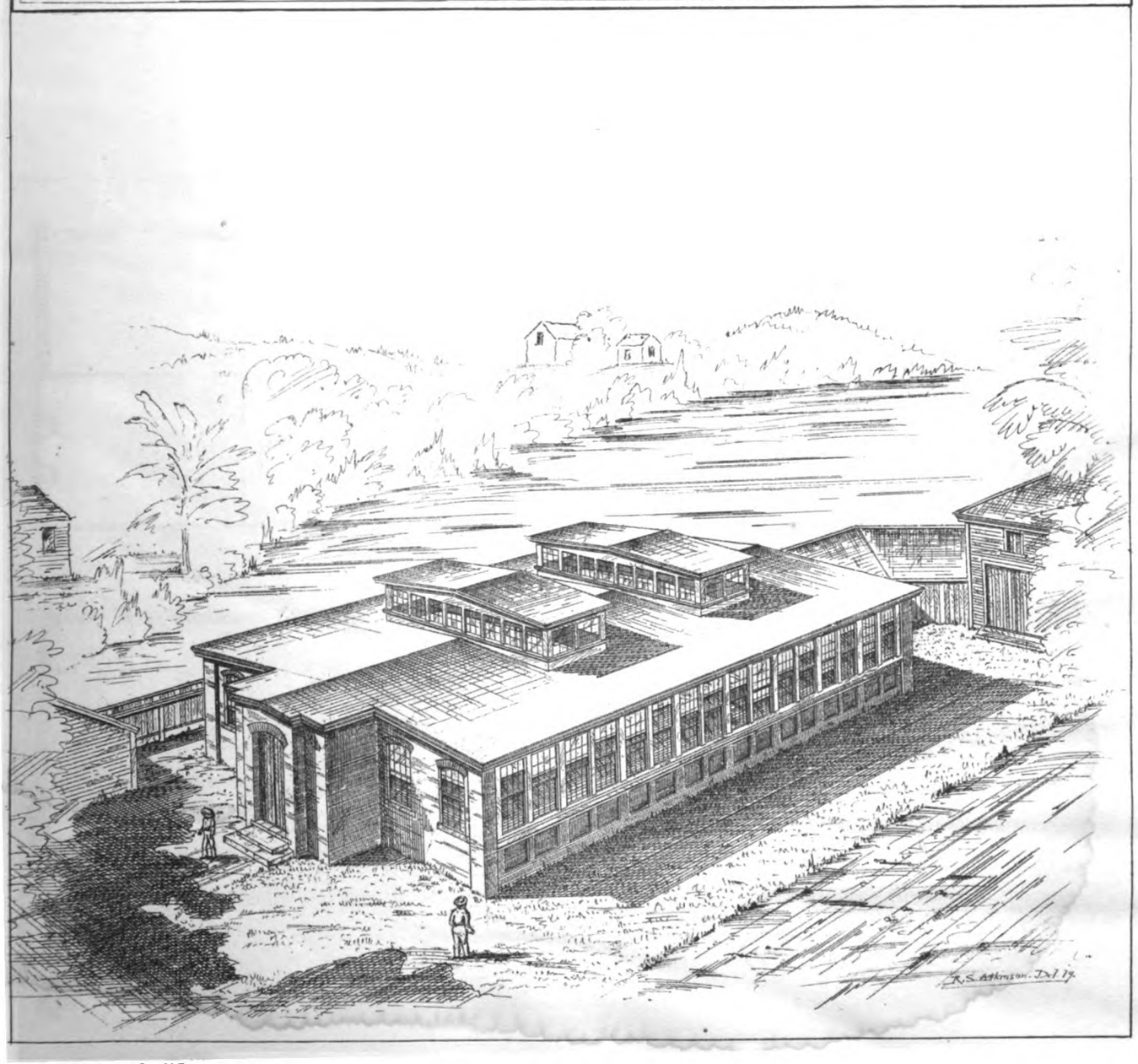
BOSTON MANUFACTURERS MUTUAL FIRE INSURANCE CO.

Construction of Roofs.



Section of Plank Floor, showing tongue & Bead (Bead Nailed on one side only.)


Rafter 10"X12" Whole or Split
Rafter 10"X12" Whole or Split
2½" Plank
Floor Beam 12"X14" Whole or Split
Floor Beam 12"X14" Whole or Split



The Heliotype Printing Co. 239 Devonshire St Boston

One Story Mill, Designed by W H.H. Whiting, Esq.

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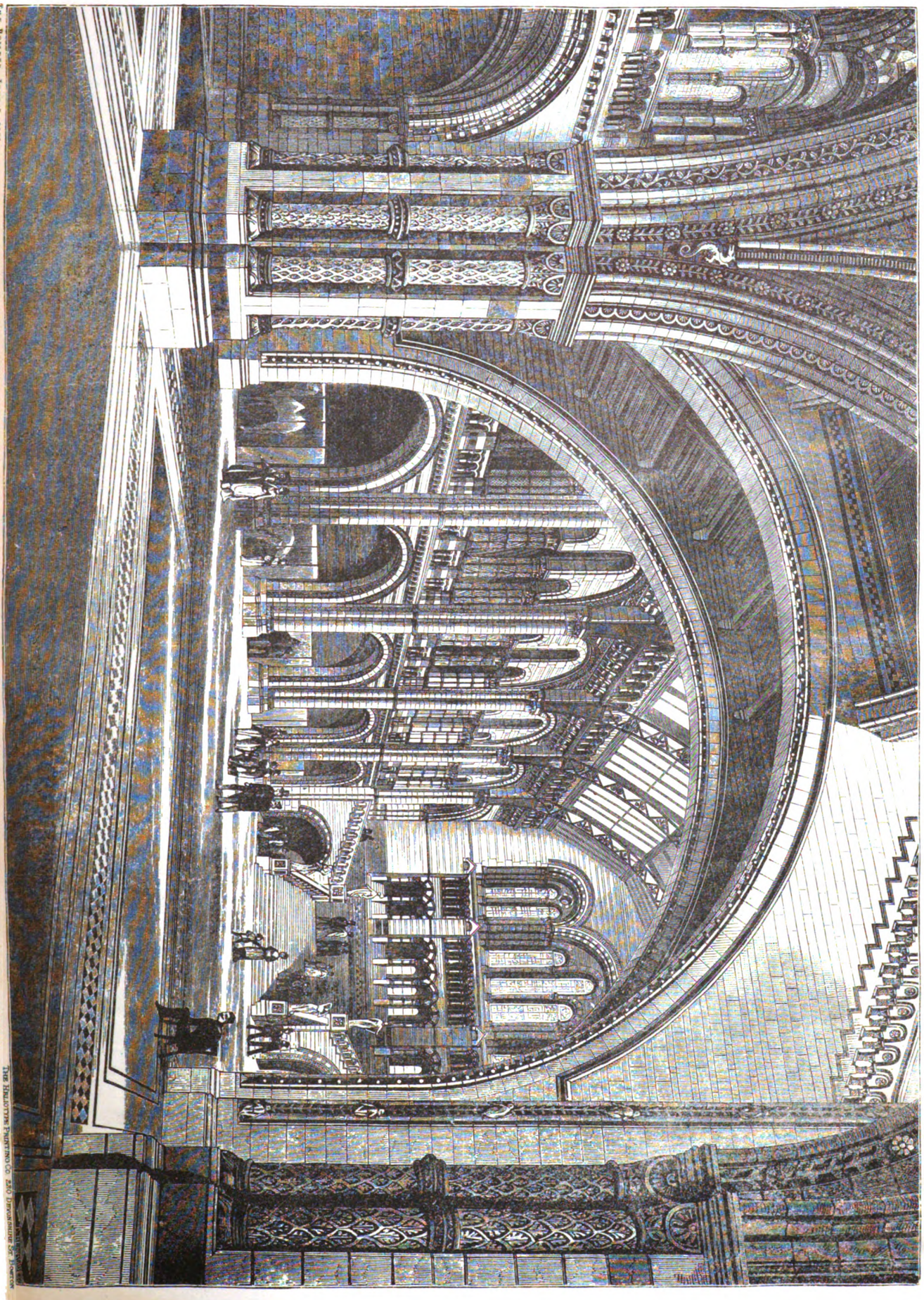

THE NEW NATURAL HISTORY MUSEUM SOUTH KENSINGTON.—VIEW OF THE ENTRANCE HALL, OR TYPICAL MODEL.—MR. WATERHOUSE, A.R.A., ARCHITECT.

THE BUILDER, JUNE 7, 1879.

THE HELIOTYPE PRINTING CO. 240 DEVONSHIRE ST. BOSTON

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gested to them that they might use new tactics to bring their employers to terms. This was some time in the latter part of June. So they constituted themselves volunteer superintendents, or rather critics of the work.

They told the reporters of the daily papers that the work was badly done, the stone poor and uneven, full of holes, which had been stopped with cement, and full of frost cracks which had occurred during the winter. This led to a public agitation and considerable discussion. But not satisfied with this, the stone-cutters, through their spokesman, Alderman Lawler, brought the matter up in the City Council, and the result was that the board requested the mayor to appoint an investigating committee of experts.

The new mayor, Carter Harrison, appointed as such committee John Adair McDowell, superintendent of the new custom-house; O. L. Wheelock, architect; L. B. Dixon, architect; John M. Dunphy, mason; and James Batchen, stone-cutter. It is said that all the experts are Democrats except the first-named.

After spending considerable time in examination and consultation, the committee reported on the 28th of July to the mayor. They state the charges made against the building to have been as follows: —

First. That the stones are inferior to sample, not being of uniform color, and being rougher in texture, having cavities filled with stopping, and deficiencies of size and shape supplied by patches.

Second. That the stones are not always laid on their natural beds, and have not the bonds and joints required by the specifications.

Third. That the anchors specified in the contract are not used.

Fourth. That all the stone-cutting is not done in the city of Chicago as required by the contract.

Fifth. That the stone-work is carried up too far in advance of the brickwork, contrary to the requirements of the specifications.

The following extract will show their conclusions on these points.

In support of the first charge, your committee finds, besides these patched, cracked, or filled stones, 257 inferior or defective stones now in place in the building. One hundred and twenty-five of these should have been rejected. Of the fifty-two patches, thirteen are bad patches. Either should not exist, and are not workmanlike.

Of the 457 cavities and deficiencies in faces of stones filled with "stoppings," the larger proportion are small spots, half an inch square or more of surface, and forty-six are four square inches of surface or more, and varying from that size to forty inches of surface.

Of the twenty-three cracks, eight are deemed bad, and of these eight three are very bad.

In support of the second charge, your committee finds ten stones not on their natural bed that should have been so set; these of the blue cast stones, which show rift or cleavage; also forty bad joints, resulting from unevenness of the stone in thickness or length; and five stones that should be reset.

Under the third charge, "That the anchors are not according to the specifications," your committee finds the anchors are not galvanized, but covered with coal-tar varnish, nor are these of the dimensions shown or required by the plans.

The fourth charge, "That all stones have not been cut in the city of Chicago," is not denied.

Under the fifth charge, your committee finds that the stone-work has been carried up in advance of the brickwork from six to fourteen feet, and the varying courses of stone protrude inwards for the brickwork bond from six inches to thirty inches.

Besides the stone in the building, your committee examined the stone on the ground.

Of the 376 delivered up to July 9, ten had been condemned by the inspector. Five of them were inferior. One was cracked. Seven were patched and thirty-three were filled in places with "stopping."

These facts substantially sustain the charges made as herein summarized.

These statements are not very clearly made, and therefore I make no attempt to summarize them. But by way of explanation the committee has made a tabulated list of the defects and deficiencies; and, comparing them with the superintendent's list of stones delivered and set, shows that there are 844 defective stones out of 4,638. They say that there are 50,000 cubic feet of stone in the building, and make the not very clear statement, "Defects to cubic feet therefore stand about one to sixty-one, or one to every sixth stone." They then say, "This represents the proportion of *total* defects, large and small, to the whole number of cubic feet in the building. But, as before stated, some of these defects are small. Hence, to give as fair a showing as possible, if we take those defects considered bad, we have the following showing:" the summing up of the table shows 241 "bad" defects, which is quite a considerable reduction, little more than a quarter of the whole. "These," they say, "make the proportion of bad defects one to every 208 cubic feet, or nearly one to every twenty-one stones now in the building." What can be demonstrated by showing the proportion of defective stones of a building, many of which contain from 50 to 100 feet, to the total number of cubic feet, is more than I can understand, but which perhaps the committee can explain.

The committee adds that "none of the defects enumerated above are excusable in good building" (but do not say whether they refer to the "small" or "bad" defects). "Nor are they warranted by any terms or any fair construction of the contract and specifications. They do not believe that these defects will be the cause of the destruction of the building in the near future. Yet they are not consistent with good building of any kind, and far less with one of the magnitude and character of a city-hall of Chicago."

The brickwork is rather gently handled. Still the committee say that the bricks are not all "sewer" bricks as specified; that they have not been laid with "sufficient wetting or slushing," and that the brickwork is far behind the stone-work. But they add that the defects in this department "are not so alarming as they have been stated to be."

The committee makes the charge that Mr. Cleaveland used two sets of plans for the exterior stone-work, the one more elaborate than the other, and that the work is done according to the least elaborate plans. This is a serious charge to make against the architect in charge; but it is so vaguely and clumsily stated, being capable of construction as an admission that a large amount of money was saved thereby instead of being lost, that in justice to the committee I will not quote it, but let Mr. Cleaveland explain the matter himself, which he and Ex-Mayor Heath did subsequently in the course of interviews published in the Chicago *Tribune*.

The committee report a deviation from the plans in a reduced thickness of the granite water-table. But this water-table was all set and covered up six months ago. At that time attention was called to its deficiency in thickness by the Lemont stone-men, who had not succeeded in getting the contract, and many stones which were not of the thickness required were taken out and replaced.

The main charge which seems to have been sustained is that the bond-stones, which were marked on the elevations of the basement and first story in the smaller piers, were not used, but that these stones were only made a little wider on the beds than the contiguous ones. It is claimed that these stones were to have gone entirely through the walls, though there seems to have been some discussion between the contractors for stone-work and brickwork, on the question whether or not the bond-stones were to be continuations of the facing-stone or separate bond-stones in the brick backing. In the latter case they would have been included in the contract for brickwork. The walls in these places are about five feet thick in the basement, and require about three and a half feet of brick backing. The experts say that 150,000 extra bricks were required to fill the places which should have been occupied by bond-stones, the number of cubic feet of stone omitted being 6,666.

The experts say in general terms that "the orders of the superintendent and condemnation of the inspector are not observed; and instead of the superintendent having been what the contract said he was to be — the director of the work and arbiter in all cases of dispute — it seems that some higher power has interfered with his work, and changed his plans and countermanded his orders." But no facts are adduced in proof of this, it seeming to be an inference from the fact that the plans in relation to bond-stones were not adhered to. They say also that they found it difficult at first to get at the facts now covered up by the progress of the work, except for the aid given by some citizens who had been looking over the work. These "citizens" seem to have been the striking stone-cutters; but Mr. Walker, the contractor for Lemont stone on the county building, who also bid for the work on the city-hall, has since publicly stated at a meeting of the building committee that he has continuously, "in his capacity as citizen and tax-payer," watched the progress of all the stone-work on this building.

The *Tribune* has published a long interview with Mr. Cleaveland. He says that the bond-stones were not left out, but that they do not go through the wall; that the plans were not altered. After the city purchased copies of Egan and Hill's design for the exterior of the county building, a new set of elevations was made, in which the stone-work was simplified and much expensive detail work left off; that all the stone-cutters figured on these plans, and that the contract is being executed under them. He admits that there are sand-pockets in the stone, and that they were filled up, but that they were very small holes, which might as well have been left unfilled. He admits that a few stones were patched, which had been mutilated after they were cut. He says that the anchors are generally longer than the specifications call for, and that in consideration of the contractors furnishing larger ones, they were allowed to cover them with coal tar in place of galvanizing them. He admits that the brickwork was carried up slower than the stone-work, as the brick contractor was not working up to time and the stone-contractor was, and therefore he did not want to delay the building by stopping the stone-work, which would give the stone-contractor a claim for damages against the city. He thinks the average thickness of stone-work is greater than that called for, all of which decreases the amount of brickwork required, sufficiently off-setting any claim for extra brickwork, due to the omission of bond-stones. He also admits that sewer-brick were called for, and that the bricks used are not all of that grade, but most of them are. Mr. Cleaveland thinks that the report contains misrepresentations and exaggerations intended to prejudice the public against the building unjustly. He says that it contains nothing to the credit of the building at all. He considers that the investigation is inspired by the stone-cutters, because the contractors would not accede to their demand of eight hours for a day's work; that an influence had been brought to bear all through the progress of the work to substitute something else for Bedford stone. He says, "Judging from what I see in the newspapers, there has been a great influence to substitute Lemont stone for Bedford."

The same paper publishes interviews with Mr. Jordan, the assistant superintendent, and others, who were on the building committee when the contracts were made. They are similar in tenor to Mr. Cleaveland's.

The report was read in the Common Council and referred to the present building committee, with order to report on the 4th of August.

Meanwhile the mayor has called on the experts for more light, and they have replied with commendable alacrity. The following are his questions: —

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First. Whether, in your opinion, the sand-holes in the stone will materially weaken the building or not?

Second. Whether the failure to lay a number of the stones on their natural bed will weaken the building or not?

Third. Whether the neglect of the contractors to furnish the anchors according to the specifications will have a tendency to impair the stability of the building or not, and, if so, how far?

Fourth. Whether the failure to carry the brickwork up along with the stonework has caused such damage as to weaken the building materially or not?

Fifth. Whether you believe that the defects will ultimately cause the destruction of the building or not, and, if not, what is meant by the "near future"?

Sixth. Whether the failure of the contractor to supply all the sewer-bricks, and to wet and slush those used sufficiently, will endanger the building or not?

Seventh. Whether the failure to have the stone have a width of bed less than one half its build or height endangers the building or not?

Eighth. Whether the piers in which no bond-stones have been used should be torn down or not, and, if not torn down, should they be strengthened: or is the building safe without these bond-stones?

Ninth. Whether with all the defects and omissions noted by you, it will be safe to finish the building, provided hereafter the work and materials be good.

Yours respectfully, Carter H. Harrison, *Mayor.*

The reply of the experts is as follows: —

First. They will not materially weaken the building, and were noticed by your committee because they were blemishes that placed such stones far below the requirements of the contract, and were inferior to the samples.

Second. Not necessarily. Where such stones are to sustain great weight, or are material to the supporting principles of the building, they do. Where they are only ornamental facings they do not.

Third. To the building as now constructed anchors as shown on the plans are important, and in event of uneven settlements positively essential. If the stones in the wall were of sufficient width of bed, and length of bond, and built up with the backing, no anchors would be needed. In reply to the latter part of the question, "If so, how far," your committee feel that to give a definite reply to this question would be assuming a knowledge impossible to acquire save by destroying, dissecting, and analyzing the entire structure, its foundations and their underlyings. The superficial view of the walls taken by your committee and the partial knowledge of their internal deficiencies, as discovered by them and reported to your Honor, is entirely too partial a basis for calculating the problem your Honor's question proposes. Even with all the knowledge possible, any answer to such a question would be only an approximation.

Fourth. This failure is not now a cause of damage, but is a deficiency in what was intended as a compound wall of brick and stone, and which wall, as now constructed (with anchors as proposed), is mainly dependent upon the brickwork for its strength. Hence an inherent weakness.

Fifth. Your committee are of the opinion that if this building is not destroyed by some convulsion of nature, or torn down for its site upon which to erect some better building, that these defects will "ultimately" cause its destruction. Simply this: a building properly and carefully constructed, of good material, will outwear one poorly put up and of inferior materials. The plans and specifications of, and the contract for, a building, either mean something or they are useless papers.

Sixth. The insufficiency is not so much in the brick as in the mode of laying them, and the wall is not as good in this respect as it should be; every defect more or less endangers the permanence of a building.

Seventh. The last clause of the answer to question No. 6 applies here.

Eighth. Your committee are of the opinion that the lesser piers, or piers between windows where there are no projecting piers, should be torn down and the bond-stones supplied as per plans, or rebuilt of dimension stone entirely.

Ninth. Your committee feel that more time would be required to answer this question fully, than can now be taken. Your Honor will see that it is a very broad and sweeping one, and that it is hardly fair to your committee to expect of them a reply so comprehensive in so brief a time. Still we do say that an independent, responsible, and fully empowered superintendent could make such additions and alterations besides the ones before spoken of, the bond-stones and small piers, and the filling up of the spaces or flues with concrete, as proposed by Mr. Kirkland, as would make it safe to continue the construction.

Very respectfully,

John A. McDowell.
John M. Dunphy.
O. L. Wheelock.
L. B. Dixon.
James Batchen.

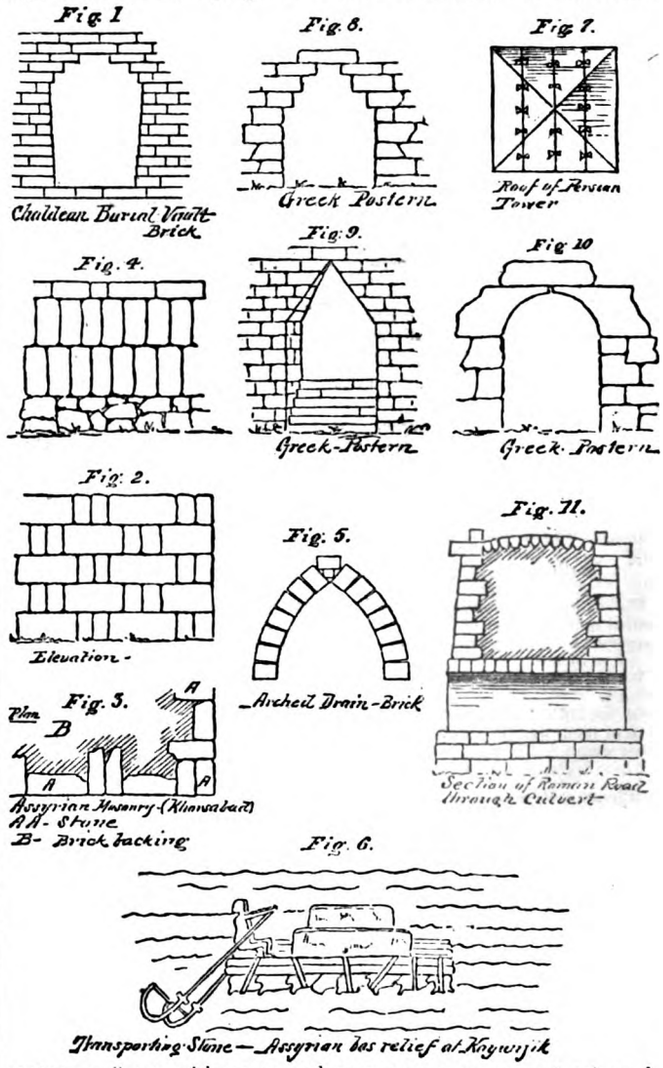
The concluding remarks in the answer refer to a private report made to the mayor by Superintendent of Buildings Kirkland, which has not been printed. I infer from the wording that he has recommended filling the hollow spaces in the external piers of basement and first story with concrete. These piers are like buttresses and support the coupled columns commencing at the second story, which carry practically nothing, as they are outside of the wall line. Mr. Cleaveland made them hollow to save unnecessary weight on the foundations and about 1,000,000 bricks.

It may be added by way of explanation that the lawful and responsible head of all building operations conducted by the city is Mr. Waller, Commissioner of Public Works. The duties of this office devolved upon Mayor Heath at the time the building was commenced. Subsequently Mr. Chesbrough, city engineer, assumed the duties of commissioner, and he was succeeded by Mr. Waller, the present incumbent, about two months ago. The Common Council can only act in an advisory capacity.

The dome "foundation" which the county had erected has now been razed to the ground, and a contract has just been made for the construction of the connecting rotunda between the two buildings.

SOME FEATURES OF ANCIENT ENGINEERING.[1]

Modern research among the ruins of antiquity is steadily relegating to the old civilization many things that we formerly thought belonged only to modern times. Almost all the *materies* of our present civilization originated among the ancients, the peculiar distinction of modern times being the wider and more rapid diffusion of our inheritance from the past and the working it over into new forms. The various textile fabrics of cotton, linen, silk, and wool that we now use, for example, were perfectly well known to the Egyptians of 4000 years ago; but the cotton-gin, the power-loom, and the steam-engine have increased their forms and variety, and put them into the hands of every one. We find the same thing true of engineering science. Canals, artificial harbors, stone bridges, aqueducts, drainage systems, high class roads, involving cuttings, embankments, and tunnels, and stone, brick, and wooden building construction of all varieties existed then as now; but the modern engineering methods differ widely from those employed by the ancients. The ancient harbor of Ostia, a magnificent work, protected from the sea triremes and craft well adapted only for navigation in the Mediterranean, while the stone docks of Liverpool harbor the ocean steamer and the enormous iron-clad man-of-war. The substructure of the modern railroad is very much the same as the old Roman military road, but in our hands its scope and efficiency have been vastly increased. A recent engineering achievement, the transport of an Egyptian obelisk from Alexandria to London, and its erection on the Thames embankment, illustrates very well, I think, our indebtedness to antiquity, and not less our progress. That we should, in this nineteenth



century, reërect, with pomp and ceremony, a monument set up in Egypt ages ago, is the strongest kind of a compliment to the ancients. It may well be doubted whether our successors of twenty-five centuries hence will think any of our efforts of this kind worth carrying 4000 miles and reërecting. Of the manner in which it was accomplished — the iron caisson-like boat, so admirably designed; the ease with which it was swung on its iron trunions and placed on its pedestal — we may justly feel proud; still the fact remains that the *fait accompli*, the end reached, was the same as that of its original designer. How the Egyptians raised their obelisks we do not yet know, beyond the fact that they were familiar with the simple machines, the inclined plane, etc.; understood the use of cordage, and had command of unlimited manual labor in the shape of captives taken in war.

We should naturally expect to find the constructive uses of the simpler building materials, stone, brick, and wood, highly developed among the ancients, and this we find to be the case. In this direction I shall consider, first, the structures found in Western Asia.

The earliest civilization in this region of which we have any records was the Chaldean, and was central in the lower part of the Tigris-Euphrates valley. This region is alluvial in character, with no stone, but abundance of clay, and was subject to frequent inunda-

[1] Portions of a paper by George Burnham, Jr., C. E., read February 15, 1879, before the Engineers' Club of Philadelphia.

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tion. The building material, consequently, was mainly brick, and the important structures were built on platforms raised above the general level of the plain. The temple at Mughier was built with parallel sides of 98 feet and 133 feet in length, and about forty feet high. The material used was small sun-dried brick, laid in bitumen, faced with kiln-dried brick. The bricks of the upper story were laid in a cement of lime and ashes. The bricks used in this and similar structures were stamped with the name of the king. In the uppermost story glazed tiles and copper nails have been discovered. The temple of Abu Shahrein (these, of course, are modern names) rests on a platform of beaten clay, cased with a massive wall of sandstone and limestone, 20 feet thick in places. From the platform to the summit of the first story extends a marble staircase, composed of small polished blocks, 22 in. × 13 in. × 4½ in., fastened by copper bolts to the bed of sun-dried bricks, on which the staircase rests.

Of these edifices Rawlinson says: "No buildings in the world, not even the Pyramids, are more deficient in external ornament. The buttresses and air-holes, that alone break the uniformity of the walls, are intended for utility only." A brick burial vault at Mughier is interesting, as exhibiting what we may call a rudimentary arch. The vault is of sun-dried brick, laid in mud, seven feet long, three feet seven inches wide, and five feet high. The sides slope gently outwards as they ascend, until the springing line is reached, when the successive layers of brick are pushed towards each other until they meet.[1]

The Chaldean ascendency in the East lasted from about 2200 to 1500 B. C., after which time the Assyrians became masters of the situation, remaining so until about 650 B. C. The centre of activity now advanced to the upper portion of the Tigris-Euphrates valley. At Nineveh, according to Diodorus, the wall surrounding the city was 100 feet high, and so broad that three chariots might drive around side by side. Xenophon, who passed close by on his famous retreat with the ten thousand, puts the height at 150 feet and the width at 50 feet. The actual greatest height of the ruins at present is 46 feet, and, from the immense mass of débris, the computation of Diodorus is probably not far from the truth. The width of the crumbled mass is from 100 to 200 feet. The construction seems to have been as follows: up to a certain height (50 feet, according to Xenophon) the walls were composed of neatly hewn blocks of fossiliferous limestone, smoothed and polished on the outside. Above this the material was sun-dried bricks. The grand halls of the Assyrian palaces constituted their principal feature. In the palace of Esarhaddon, the son of Sennacherib, the hall was intended to surpass all its predecessors. Its length was to be 165 feet, its breadth 62 feet, making an area of over 10,000 square feet. The builder appears to have been unable to roof the hall, and was obliged to divide it by a wall down the middle, which, though he broke it in an unusual way, and kept it some distance from the ends of the apartment, still had the actual effect of subdividing the room. The method of roofing these palaces is not certainly known; some investigators holding that brick vaulting was used, while others think that wooden beams were employed. Others, again, imagine that the portions near the walls, only, were covered, leaving the centre open for light and air.

The masonry at Khorsabad was of three kinds: That of the palace mound, forming a portion of the outer defence, was composed entirely of stone, square hewn, of great size, laid dry and backed with brick. Figs. 2 and 3 show an elevation and horizontal section of this wall. The bond is made up of stretchers, alternating with double-headers; the reënforced corner and the bonding of the stone into the brick backing are points worthy of notice. The stones measure from two to three yards in length, three feet in width, and five to six feet in height.

The rest of the defences were of inferior character. The material was stone, but not so carefully hewn. The third kind, illustrated in Fig. 4, was found outside the main wall. Stone only was used, the lowest course being rough rubble-work; above this were two courses of carefully squared stones, about one foot long and six inches wide, placed on end, care being taken to break joints.

Although the ancient architectural construction was mainly trabeate in its nature, the old notion that the round arch was of Roman and the pointed arch of Gothic origin has been dissipated by the spade of the Eastern archæologist. I have already spoken of the elementary arch of the Chaldeans, but the Assyrians used the true arch. All the Assyrian arches hitherto unearthed are of brick. Round arches are found both in crude and kiln-dried material, the bricks, in every case, having the proper wedge-shape section, with curved extrados and intrados. These arches are almost wholly found in underground construction, as drains, etc., the greatest span hitherto discovered being fifteen feet. They are mostly semicircular. The only pointed arch found by Mr. Layard is in a drain under the N. W. Palace of Nimrud, and is very peculiar in its construction. The bricks used are ordinary rectangular brick, laid as in Fig. 5. The arch is keyed with two layers of brick with their beds horizontal. The mortar joints are, of course, slightly wedge-shaped.

The faults of Assyrian construction are not less interesting than its merits. Although there was plenty of stone at hand, they used sun-dried brick, merely faced with stone, because they had learned a certain style in the alluvial Babylonia, and having brought it with them to a country far less fitted for it, they raised in comparatively hilly Assyria the type of building that was the natural outgrowth of the flat, stoneless plain that was their primitive abode. The earthen platforms upon which they built must inevitably have bulged and settled sooner or later; the problem of the retaining-wall that still troubles the engineer proved fatal to many an Assyrian constructor.

Hence, while the massive buildings of Egypt stand to-day, the Assyrian palaces are almost shapeless ruins. That the Assyrian king so frequently destroyed the palace of his predecessor, and built afresh, is probably due to the rapid decay of the edifice rather than a mere desire to excel his forerunner. That they found no difficulty in transporting large stones is evidenced by their bas-reliefs. Fig. 6, taken from a bas-relief at Koyunjik, shows a boat loaded with such freight proceeding down a river. The lower part of the craft is made of inflated skins, to which are lashed logs for the flooring.

The colossal human-headed bulls, of such frequent occurrence in Assyrian art, and which weighed many tons, were placed on the top of artificial platforms, from thirty to eighty feet high. The fact that they finished the detail of the statue before transportation shows that they were perfectly confident of their ability to move it without mishap. An Egyptian sculpture near El Bersheh shows a colossal statue in process of transport. On the knees of the figure stands a man, probably beating time and giving out the words of a song. At the prow of the sledge a man is pouring something from a vase, perhaps grease. Platoons of soldiers accompany the march. A number of men are delineated carrying water (or possibly grease) and unknown implements. Task masters and reliefs of men follow. We have seen that the Assyrians, who came into power 1150 B. C., knew the brick arch, but we find that it existed in Egypt as early as 1540 B. C. The stone arch is found there, constructed about 600 B. C.

The last rulers of Western Asia, before the advent of Alexander, were the Persians, from 553 B. C. to 333 B. C. These Aryan Persians did not follow their Semitic predecessors in all their architectural forms, but originated a style that is suggestive of the Greek, using the column very largely.

A curious edifice, belonging probably to the later Archæmenian times, is a square tower, composed of large blocks of marble cut with great exactness and joined together without any mortar or cement of any kind. The building is thirty-six feet high and twenty-four feet square. The doorway is not at the bottom, but half-way up, and must have been reached by a flight of steps. The most interesting feature, however, from our point of view, is the roof, which consists of four large slabs of stone, reaching entirely across from side to side and measuring about twenty-four feet in length, six feet in width, and from eighteen inches to three feet in thickness. The slabs are cut to slope each way from the diagonal lines, and were originally clamped together in a very careful manner by iron clamps. This construction is shown in plan by Fig. 7.

I shall pass by Egyptian stone-work, not because it is less worthy of notice than that of Western Asia, being, on the contrary, much more remarkable, but because for that very reason it has been more generally discussed, and you are doubtless familiar with its general character. As to the mechanical methods used, however, a few words may be of interest. In blocks of very great length, as the columns at Fateereh, which are about sixty feet long and eight and one half feet in diameter, certain pieces of stone were left projecting from the sides, like the trunnions of a gun, to which the ropes were attached. The largest of the obelisks, which is at the temple of Karnak, weighs about two hundred and ninety-seven tons, and was brought about one hundred and thirty-eight miles from the quarry to where it now stands, and those taken to Heliopolis passed over a space of about eight hundred miles. The method employed was the same as that already described in the case of the colossus. The skill of the Egyptians was not confined to the mere moving of great weights. Their knowledge of mechanism is shown in the erection of the obelisks and in the position of large stones raised to a considerable height and adjusted with the utmost precision; sometimes in places where the space will not admit of the use of the inclined plane. Some of the most remarkable are the lintels and roofing stones of the large temples, the lofty doorway leading into the great hall at Karnak being covered with sandstone blocks forty feet ten inches long and five feet two inches square. In one of the quarries at Syene is a granite obelisk which, having been broken in the centre after it was finished, was left in the exact spot where it was separated from the rock. From the dimensions of the quarry, and the situation of the stone, it must have been lifted bodily, as was the case also with the other stones taken from the same quarry.

Among the most famous feats of ancient military engineering were the canal and bridge of Xerxes. On account of a former disaster to his fleet in rounding Mt. Athos (a stormy promontory resembling our Cape Hatteras in this particular, and which Greek sailors still dread to pass), Xerxes determined to cut through the peninsula by a canal twelve furlongs across, the neck of the peninsula being comparatively level. The work was done by the neighboring peoples, each nationality doing a certain portion. Herodotus, who seems to have been a historian with considerable engineering sense, says: "The sides fell in continually, as could not but happen, since they made the width no greater at the top than it was required to be at the bottom. The Phœnicians, however, showed their usual skill by making the part assigned to them twice as wide at the top as it was required to be at the bottom." The other work that I have mentioned was a pontoon

[1] Compare Figs. 8, 9, 10, representing early Greek construction.

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bridge across the Hellespont from Abydos to Sestos, for the transport of his enormous army. The channel at this point is about one and a half miles broad. A storm having destroyed the first bridge, Xerxes gave orders that the Hellespont should receive three hundred lashes, and that a pair of fetters should be cast into it. Herodotus says that the lashers uttered these words while scourging the Hellespont: "Thou bitter water, thy lord lays on thee this punishment because thou hast wronged him without a cause, having suffered no evil at thy hands; verily, King Xerxes will cross thee whether thou wilt or no. Well dost thou deserve that no man should honor thee with sacrifice, for thou art in truth a treacherous and unsavory river." While this interesting ceremony was in progress, he likewise commanded that the overseers (engineers?) should lose their heads — a fate that should reconcile the engineer of to-day to his lot.

I shall treat very briefly of the Roman works, as these are well known. The Cloaca Maxima or great sewer of Rome, ascribed to the last three kings, *i. e.*, about 520 B. C., is still preserved for a distance of one thousand feet, and still conducts the drainage from the Capitoline and Palatine hills to the Tiber. It is probable that the Etruscans were the designers of this and other early Roman works, as this remarkable nation was already far advanced in civilization when the Romans were ignorant rustics. An arched vault of tufa, with arches of travertine inserted into it at intervals of ten feet, covers the canal, which is about twenty feet wide. The original height was twelve feet, now reduced to from six to seven feet by silting, in spite of frequent cleanings. To prevent inundations or reclaim arable lands, lakes and marshes were drained by works called emissaria. These were either open or covered, and involved, in some instances, a considerable amount of tunnel work.

The drainage of Lacus Fucinas, which was subject to dangerous inundations, was planned by Cæsar but not executed until the time of Claudius (9 B. C.–54 A. D.). The whole basin was laid dry; this being effected by a shaft cut through the solid rock from the lake to the river Levis (now Garigliano), which discharges into the Mediterranean. The tunnel was 15,000 Roman feet in length, 9 feet wide, and 14 feet high. Vertical shafts were sunk for the removal of the débris, and inclined shafts for the ascent or descent of the workmen. The solidarity of the Roman Empire allowed the construction of roads that would not have been possible in disconnected Greece. The nature of the ground was almost wholly disregarded as influencing the alignment of the road. Mountains were cut or tunnelled, depressions filled, deep valleys or rapid streams spanned by bridges of bold design.

Of tunnels I will mention the so-called Grotto of Posilippo, near Naples, which is still used. It is 2,300 feet long by $20\frac{7}{16}$ wide, arched at both ends, with spans of 81 and 84 feet. The material pierced is solid rock.

ONE-STORY MILLS.

To the Editor of the American Architect:

Dear Sir, — I send you herewith a picture of a one-story knitting mill, for which the plans were made by our Mr. W. H. H. Whiting. It meets the necessary conditions of the work in the best manner.

It would be interesting to have some of your contributors give "architectural effect" to this building without impairing its use or making it dangerous. A good example of such work would enable us to direct the owners to whom to apply in order to relieve themselves of the charge of contributing to the "dreariness" of the factory towns.

Some observations have been made during the heated term as to the comparative heat in a one-story weaving mill, one acre in area, and the second floor of a four-story mill, from which the looms were removed. The heat was the same in the one-story mill where 1,000 looms were in operation as in the old room in which no work was in process.

I beg leave to call your attention to the work of C. Lang, a pupil of Pettenkofer, upon "Natural Ventilation" (Stuttgart, 1877), in which you may find reason to change your opinion that a covering of plastering upon a timber will exclude air sufficiently to cause rot. This work gives the facts, based upon exhaustive experiments, as to the porosity of mortar, brick, stone, and other materials used in building, and the circulation of air through such substances.

The beams in the Mason & Hamlin Co.'s building are cut off from all circulation of air except that which passes through the plaster or the floor above, the furring on which the wire-lath is fastened being only sufficient to give the plaster room to lock inside the interstices of the lathing. E. A.

P. S. — Losses by fire in the United States, in June, $6,361,500. Hotels as usual head the list; fires twenty-seven in number. Losses by fire in the United States for six months ending June 30, 1879, $47,026,800. E. A.

THE ARCHITECTURAL EXPRESSION OF THE PLAN.

To the Editor of the American Architect:

Sir, — Your contributor, J. A. F., in his interesting paper on "American Dramatic Theatres," speaks of the New Opera in Paris as if the expression in its façades of the essential features of the plan were a novelty in theatre architecture. In the Brooklyn Academy of Music, built twenty years ago after the designs of Mr. Eidlitz, the three great divisions of the building — the *foyer*, auditorium, and stage — are separately roofed, and their several purposes quite as distinctly expressed as in the recent French example. M.

NOTES OF EXPERIENCE AND INEXPERIENCE.

31. Sewage in the Irrigation System. — The undersigned will be happy to furnish M. P. with particulars of several cases of subsoil irrigation on the Moule or Waring system, wherein there has never been the slightest obstruction from freezing in winter, although the pipes are less than twelve inches below the top of the ground. Mr. J. C. Bayles, of New York, the town authorities of Lenox, Mass., several parties in Philadelphia, in Orange, N. J., and elsewhere, besides Colonel Waring himself, can give all needed information. I have myself never heard of a case where the working of the system was injuriously affected by frost.

T. M. Clark.

32. Bond-Stones in Piers. — Could you, in your valuable paper, inform me how and in what relation to crushing strength do bond-stones act in disconnected piers (brick), and in what proportion do they strengthen the piers? Young Architect.

33. Books on Construction. — Could you give me the name, and when published, of the latest work on building construction, either English or German publication, one that is detailed, and is authority?

J. H. H.

NOTES AND CLIPPINGS.

The Round-House Accident at Buffalo. — The coroner's jury impanelled to determine the cause of the death of the workman who was killed by the falling of a roof-truss of the round-house of the N. Y., L. E. & W. Railroad has returned the following verdict: "The said Irving Hall came to his death on the 19th day of July, 1879, through injuries sustained by the falling of the trusses used in the construction of the roof at the Erie round-house at Buffalo; that said trusses were not safely and properly secured in their places; that the labor employed by the Leighton Bridge and Iron Company, and the supervision at the time of the accident, were inexperienced and incompetent, and that the Leighton Bridge and Iron Company are responsible for the accident."

We have received a communication from the Leighton Bridge and Iron Company disclaiming the responsibility in the following terms: "The decision was contrary to the testimony, and the blame no doubt was attached to us as we were the only ones doing work except Buffalo parties. The roof fell after we had completed our contract, and with every bar of iron in its proper place, and while it was in the hands of the carpenters."

A Pneumatic Despatch Tube. — Shavings from a planing-mill in Chicago are, by an air-blast, blown seven hundred feet through a fifteen-inch sheet-iron pipe, to a distillery, where they are burned for fuel.

The Washington School-House. — We are not surprised to learn that the commissioners of the District of Columbia have so altered the design which was accepted in the competition of a school-house for the city of Washington, upon which we commented some time ago, that its architect, Mr. Lautritzens, disclaims all authorship of them.

Air Cushion for Falling Elevators. — Some time since we published a description of a patent just issued for using an air cushion to break the jar of a falling elevator car in case of accident. An apparatus based on, perhaps, similar principles, has been put into practical use in Chicago by the inventor, Colonel A. C. Ellithorpe, and subjected to serious tests in the Chamber of Commerce, where the elevator car, which itself weighed two tons, was loaded with five thousand pounds of iron, and, to test the real merits of the invention, a basket of eggs and some glass globes; the car was then dropped from a height of forty feet, and was checked so gradually by the air at the bottom of the shaft that neither an egg nor a globe was broken. This encouraged two men to drop with the car, and they reached the bottom not only in safety, but almost unshaken.

Tenement-House Reform in London. — Tenement-house reform is as complex a problem in London as it is in New York. The *Pall Mall Gazette* shows how heavy is the loss which the metropolitan rate-payers are likely to sustain from the operation of the Artisans' and Laborers' Dwellings Act. The main object of the act was to clear away the over-crowded dens of the metropolis, and to provide for the erection of healthier dwellings in their place. When it was passed it was thought that there would be little difficulty in disposing of the sites at their cost price at least, but experience is against that expectation. The Metropolitan Board of Works, indeed, has recently accepted an offer made by the Peabody trustees for the purchase, at the rate of $50,000 an acre, of certain vacant spaces for which the Board paid $400,000 an acre. The gross loss to the rate-payers on this transaction alone is estimated at $3,215,000. It is said that if no better terms can be obtained for the land to be cleared under other schemes now before the Board, the total loss will be between $10,000,000 and $15,000,000.

The Duke of Brunswick's Mausoleum. — The six marble statues of his ancestors, which, under the late Duke of Brunswick's will, are to be placed around the sarcophagus containing his body, have been mounted on their red granite pedestals about the mausoleum in the Place des Alpes, Geneva, Switzerland, which was begun three years ago. This magnificent memorial of a most generous benefactor is expected to be finished before the end of September, and will probably form one of the most striking monuments on the Continent. A full description of the monument was published in the *American Architect* for July 7, 1877.

Cologne Cathedral. — The scaffold which surrounds the southern tower of the Cathedral of Cologne has been raised another stage, and it ow appears certain that the cathedral will be finished next year.

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THE latest experiment in model tenement-houses is described in the New York *Evening Post* of the 5th inst. It seems to embody the features which by experience have been found essential to success in such enterprises; it is not a charitable undertaking, but a business-like investment of property, from which the owners expect to realize a safe and regular income, — the only foundation upon which any results really affecting the well-being of society can be raised. The practical points aimed at are abundance of air and light in every room, reasonable safety from fire, security from uncleanliness, thoroughness in construction, and a decent regard for the natural desire of mankind to live orderly lives. The architects, Messrs. Field & Son, of New York, propose to realize these essential conditions by isolating the staircase in a brick tower, projecting four feet from the centre of one façade, and communicating with the apartments only by a series of slate and iron exterior balconies, by which the occupants are to gain access to the corridors upon which the various suites are to open; by having no living-rooms or bed-rooms without exterior light; by avoiding furred walls; by having washrooms in separate towers, so contrived that the hose may be turned on floors and walls alike; by providing ample shutes for dust and ashes; by having a separate straight flue for each room, and a flat roof protected by a railing, adapted for the out-of-door uses of the tenants and as a safe and ample play-ground for their children, with an open *loggia*, apparently, in the upper story of a corner tower, where the occupants may sit and enjoy the luxury of cool breezes under cover in the hot weather. The most significant and most encouraging fact in connection with this enterprise is that it is a direct result of the recent agitation of this most important subject, and, if it proves a good investment, it will be followed by others in various parts of the city. The poor we have always with us; to make these a source of wealth instead of an object of charity is a primary condition of civilized life. We are entirely persuaded that if capital will continue in this manner to provide improved and improving homes for the "dangerous classes," they will no longer be dangerous, but, in returning to capital an honest percentage of profit, will increase in self-reliance and self-respect and constitute the strong foundation of the commonwealth. In forwarding such uses of capital by every means in our power, we conceive that we shall perform our highest duty as a journal devoted to the interests of building.

ON the 6th inst., the scaffolding of the dome of the new music hall in Chicago, overweighted by a heavy iron bearing-plate weighing five or six hundred pounds, which the workmen were putting in place in the dome, fell to the ground, a distance of sixty feet, and severely injured four of the workmen who were employed upon this insecure footing. This seems to be still another instance of the recklessness with which temporary stagings are too often constructed in this country. A scaffolding of four-inch studs, eight or ten feet apart, spliced end for end with splinters of boards, and braced more or less securely with other boards, with foot-planks tilting upon bearings of ledger-boards on edge secured to the tops of these shaky poles, the whole depending upon the capacity of tenpenny nails to bear cross strains, — all this, however light and airy, is found so capable of bearing distributed weights in the ordinary processes of building, and gangs of masons, carpenters, iron men, plasterers, and painters, successively occupy its perilous heights with such impunity, that if the vigilance of the foreman is now and then put to sleep and the whole rickety construction collapses under a concentrated weight, like the iron plate in this Chicago work, perhaps we must blame rather the system than the man. The evidence of the newspapers as to the character of this especial staging is of course extremely various, and we must await the verdict of the coroner's jury. It is worthy of inquiry whether there is not a virtue of greater security in binding together the different members of such a staging with ropes at the intersections, as practised on the continent of Europe, instead of with two or three tenpenny nails, to which we have so long committed the lives of our workmen. Our whole system of scaffolding, with its ledger-boards and put-logs, especially when spread over a wide interior for the purpose of enabling workmen to gain access to every part of a roof, needs something more than the mere following of a convention in the construction; it needs constant watchfulness in the maintenance, and a jealous scrutiny, that irresponsible people, for the greater convenience of their work, may not knock away the most essential members. In the present case the verdict of the inquest should be in such form as to serve as a warning and as a safeguard for the future. Such accidents have become far too frequent.

CLEOPATRA'S needle, the famous standing obelisk at Alexandria, whose prostrate brother has been reërected after such various fortunes upon the banks of the Thames, was formally presented to the city of New York by the late Khedive, as we mentioned a short time ago, and, a citizen having furnished the means to defray the expenses incident to its removal, an officer of our navy has been granted six months' leave of absence for the purpose of visiting Egypt and constructing the appliances necessary for transporting the curious shaft to these strange, modern scenes. He is now, we believe, engaged in examining vessels in Philadelphia with a view to selecting and preparing one for this especial service. This obelisk is several feet longer than the one on the Thames embankment, and is said to be in fair condition. The hope is entertained of delivering the shaft safely in December, and thus placing New York on an equality with Rome, Paris, London, and Florence as an obelisk-bearing city before the close of the year. If the sedentary habits of this ancient monument have not undergone a change since the time when Rameses II. laid hands upon it more than three thousand years ago and moved it from Heliopolis, where it had already stood a century, to the borders of the Mediterranean, it must feel a stirring of indignant shame through all its hieroglyphics at this disrespectful Yankee haste. When the New World stands in the presence of this monument of thirty-three centuries, let us hope that our people will at length become conscious of the real significance attached to the shape and details of this venerable monolith, and will understand that our attempt to parody it with a bare pile of stones built up to an enormous height is a mere piece of barbarism, — an empty boast, conveying no thought and satisfying no rational desire of civilization. If our one hundred years of activity have been more fruitful in the experiences which advance civilization than the thirty-three hundred through which this pictured shaft has slept, certainly with our resources of art and money we should build in the memory of Washington a monument more significant and worthy than an imitation of this record of the pious exploits of Thothmes III.

THE Chicago *Inter-Ocean* has taken the lead in a discussion, which has extended to other papers, on the proper construction of lightning-rods, in the course of which some valuable suggestions have been made. The unanimous testimony of those who profess to know the facts is that glass insulators are worse than useless, and the best practice seems to be to connect all gas and water pipes, gutters, flashings, and other metal-work in buildings directly with the rods. These should be of thick iron or copper: the idea that the conducting capacity of a rod depends upon its surface has long been exploded, and the probability is that the transmission of atmospheric, like voltaic electricity, is in proportion to the mass, not the surface, of the conductor. Certain late experiments have tended to show, however, that the superiority of copper over iron is not so marked in the transmission of atmospheric as of voltaic currents. All the observers

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agree as to the extreme importance of a good connection with moist earth: the principal difference seems to be in regard to the proper number and spacing of points. The old idea that a rod protected a circular area the radius of which was twice its own height has frequently been shown to be erroneous, and to meet the sudden and rapid discharges caused by high winds or violent electrical disturbance probably three or four vertical branches are advisable on a building of moderate size. It is often noticed that lightning strikes the prominent portions of a structure toward the wind, and this suggests the guarding of the gables or other exposed points to meet currents approaching from all quarters. The utility of the secondary points or tridents with which many houses bristle is seriously questioned. One writer asserts that the object of the point at the top of the rod is to increase the tension at that part, and thus aid the silent escape of the electricity from the ground and the connected building into the cloud, or *vice versa*, which may easily be understood by any one who has seen the quiet discharge of the conductor of an ordinary electrical machine by a point either attached to it or presented toward it, and he contends that every additional point divides and diminishes the tension, and lessens the efficacy of the rod. This subject may be easily and profitably studied by any one who has access to a good plate or cylinder electrical machine, and we hope for more light upon it. Meanwhile it is gratifying to see the general accord of the most intelligent writers against insulation, and in favor of connection of all the metal-work of buildings with the rods. If this system, under which it is asserted that the ships of the British navy have been so well protected that there has not been the slightest damage from lightning on board one of them for thirty years, were to be popularly understood and accepted, we should have less reason for the common saying that the devices of the rod peddler are more dangerous than the lightning itself.

A suggestion is made for improving the city of Washington, which is not likely to be soon acted upon, but has some good points. Mr. Private-Secretary Rogers proposes that the offensive flats south and west of the Capitol should be filled in, and a sea-wall built, so as to obtain an outfall for the sewers in a swift current; the land south of the Capitol to be condemned, the shanties which now occupy it removed, and the whole to be laid out in a series of parks. He would also extend the present Mall and Botanical Garden up to the south side of Pennsylvania Avenue, clearing that side of buildings the whole distance from the Capitol to the Treasury. Most people would say, we fancy, that there were already too many parks in Washington, and too little building, and what building there is seems inclined to desert the Capitol, while the Capitol turns its back upon it in return. It would be in many respects a serious misfortune to lose the view of the south front, the most picturesquely lighted of all the sides of the Capitol, in the shrubbery of a park, and if the drainage of the southern district were so far improved as would seem practicable under Mr. Rogers's scheme, the space between the Capitol hill and the river would be an excellent district for the best residences of the city, well situated for receiving the cool breezes from the river in summer, and sheltered by the hill from the winter winds, convenient at once to the Capitol and the government offices, to both the railroads, and the Virginia shore, while the margin of the Potomac itself could be formed into a magnificent street, far surpassing the Thames Embankment, the Riva degli Schiavoni at Venice, or the Nevskoi Prospekt at St. Petersburg. Some of these days, when the contrast between the map of Washington and the reality grows less painful, we think it very probable that the tendency may be in this direction.

We think it useful to give due publicity to the enterprise of Messrs. Raeder & Ramsey, architects, of St. Louis (or of Mr. Charles K. Ramsey, who seems to have succeeded this firm). These practitioners have adopted an advertising expedient not without ingenuity in its conception and doubtless satisfactory in its pecuniary results. They have published an "Architectural Guide" for gratuitous circulation, containing illustrations and descriptions of such of their works as they thought would best set forth their capacities to serve the public of St. Louis and of its neighborhood; these alternate with advertisements of various building materials and appliances which are recommended by the architects in question, and serve as a sort of side-show. We conceive that the circulation of this book was intended to be confined to the far West, because among the illustrations we discover over the unblushing legend, "Raeder & Ramsey, architects," the design of the Shillaber Building on Court Street in Boston, published in this journal August 19, 1876. We do not suppose that Messrs. Cummings & Sears, the architects of this building, will be inclined to take any action with regard to this, but in the interest of common decency and honor in the practice of the profession, we cannot suffer it to pass by without an appreciative notice, which we trust may reach the neighborhood where it will do the most good.

THE OPEN FIRE-PLACE. XIV.

Table VII. shows the heating power of the Jackson Fire-Place. Before lighting the fire the anemometer at the register was motionless, showing that the air was stagnant, and the ventilation nothing, or at least imperceptible, inasmuch as the doors and windows were tightly closed.

The moment the fire was kindled a current of fresh air set in, and in a few moments became powerful enough to blow out the light of a candle held in it, and warm enough to melt the wax. As will be seen by the table it poured into the room at the rate of one hundred and thirty-eight meters a minute, heated nearly to the boiling point of water. Indeed, so great was the heat that the metallic part of the anemometer held in the current soon became too hot to touch, and showed that where hot fires are needed the mantel-shelf used over these fire-places should be constructed of terra-cotta, marble, or some incombustible material, in order to avoid danger of destruction by the heat.

In order to render the tests more reliable, a wooden box or flue was built around the fresh-air inlet register, to collect the air and conduct it outwards and upwards so that the thermometer placed in the current would be protected from radiation from the fire-place and other external sources. The air thus collected entered the room, of course, in a stronger current than it would otherwise have done.

TABLE VII.

Time: Evening of July 10, 1879.	Temperature of the Fresh-Air Current.	Velocity of the Air in Meters per Minute.	Cubic Meters of Air entering the Room.	Difference of Temperature between Outer Air, and Air entering the Room.	Equivalent in Cubic Meters raised 1°.	Weight in Kilograms.	Remarks.
1	2	3	4	5	6	7	8.
6.30	25°	0	0	0°	0		
.40	26	21	.4	1	4	4.8	Fire lighted.
.45	34	45	.8	9	11.3	13.6	Full blaze.
.50	46	63	1.1	21	99.5	109	2d kilo. put on.
.55	62	63	1.1	37	180.4	198	
7.	75	75	1.1	60	259.6	280	3d kilo. put on.
.5	90	117	2.1	65	501.9	500	
.10	95	138	2.5	70	757.6	757	
.15	97	138	2.5	72	836.8	840	Fire declines.
.20	94	130	2.2	69	783.8	788	Fire out.
.25	86	123	2.0	61	670	720	
.30	80	120	2.0	55	602	660	
35	75	110	1.7	50	425		
.40	71	96	1.7	46	391		
.45	65	94	1.7	40	357	1972	
.50	60	93	1.7	35	328		
.55	56	93	1.7	31	297		
8.	54	92	1.7	29	272		
.5	52	91	1.7	27	240		
.10	50	90	1.6	25	200	1184	
.15	49	87	1.6	24	190		
.20	47	85	1.6	22	175		
.25	45	80	1.6	20	160		
.30	44	77	1.6	19	140		
.35	42	75	1.5	17	120	698	
.40	40	72	1.5	15	110		
.45	39	70	1.4	14	100		
.50	38	68	1.3	13	85		
.55	37	66	1.2	12	70		
9.	37	64	1.2	12	65	396	
.5	36	63	1.2	11	60		
.10	36	62	1.2	11	50		
.15	35	61	1.1	10	48		
.20	35	61	1.1	10	45		
.25	34	60	1.1	9	40	256	
.30	34	60	1.1	9	40		
.35	33	59	1.1	8	38		
.40	33	59	1.0	8	35		
.45	32	58	1.0	7	30		
.50	32	58	1.0	7	28	171	
.55	31	57	0.9	6	25		
10.	30	56	0.8	5	23		
.10	29	55	0.8	4	18		
.20	29	54	0.7	4	18		
.30	28	53	0.7	3	10		
.40	28	52	0.6	3	8		
.50	27	51	0.6	2	6	144	
11.	26	50	0.6	1	4		
.10	26	49	0.5	1	2		
.20	26	48	0.5	1	0		
						9671	

By the combustion of 3 kilograms of wood enough heat was saved to raise the temperature of 9,671 kilograms of air 1° Centigrade (supposing the air at 0°, 20°, 40°, 60°, 100°, weighed respectively 1.3,

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1.2, 1.1, 1, and 0.9 kilograms per cubic meter). This is equivalent to 2,321 units. The wood used in the experiment contained 9 per cent, by weight, of water. Allowing for perfectly dry wood 4.000 units, our wood would yield .91 × 4,000 = 3,640 units per kilogram, and for 3 kilograms 10,920 units. But to evaporate the .09 of water contained in the wood would render latent (531 + 75) × 3 × .09 = 164 units of the heat generated. This should therefore be deducted from the 10,920 units, giving an available power of 10,756. In the above equation 531 represents, according to Despretz, the number of units rendered latent in transforming 1 kilogram of water 100° Centigrade to vapor under ordinary atmospheric pressure, and 75 represents the number of units required to raise to the boiling point the temperature of 1 kilogram of water from 25° Centigrade, which was the temperature of the outer air and of our fuel at the beginning of the experiment. The amount saved, 2,321 units, was therefore $\frac{2321}{10756} = 21$ per cent of the total available heat generated. Add 6 per cent for that obtained for direct radiation, and we have 27 per cent utilized. Adding, as before, 5 per cent where the upright iron flue is added, and we have a grand total of 32 per cent obtained by the Jackson Fire-Place.

Few persons realize the extent to which kiln-dried wood reabsorbs the moisture expelled by the drying. The wood used in the experiment had been kiln-dried, but had again absorbed from the atmosphere 9 per cent of water. A portion of that used was cut up into small pieces and weighed. It was then redried and weighed again. The drying was conducted in an air bath maintained at a temperature of 150° Centigrade. Before drying the sample weighed 36.155 grams, and after drying only 33.169 grams, showing a loss of 2.986 grams, or nearly nine per cent of the whole; or, in other words, that the kiln-dried wood used in our experiment had reabsorbed 9 per cent of water from the atmosphere.

In testing the wood used in the experiments on the Dimmick and Fire-Place Heaters, the sample, weighing 22.683 grams, lost, after drying for twenty minutes in air heated to 150°, 3.097 grams, or thirteen per cent of its weight. A further exposure for three hours to the drying heat reduced its weight only twenty-two ten thousandths of a gram, so that the wood might then be considered as practically dry. The sample was then exposed for a week to the air of the house, and again weighed. It was found to have regained the greater part of the water expelled by the drying. It weighed 21.33+ grams, showing a gain of 1.774+ grams, or seven per cent of its weight. The rapidity with which kiln-dried wood, when fresh from the kiln and very dry, absorbs moisture from the air was shown in the process of weighing our samples. When placed on the scales immediately after drying it was found to gain two or three ten thousandths of a gram per minute. These experiments on the dryness of wood show how much the calorific power of the material is affected, not only by the method of preparing it, but also by the time it has stood exposed to the air after drying, and even with the condition of the atmosphere at the time of its use. The kiln-dried wood tested showed a variation of 8 per cent in the amount of moisture it contained after drying. In other words, its available calorific power varied between 4,000 and about 3,600. Hence the importance of knowing the hygrometric condition of our wood before making our experiments. Hence, also, the economy of seeing that the wood we buy for fuel is perfectly dry.

These experiments were made in the laboratory of Mr. W. E. C. Eustis, whose liberality in offering me the free use of a set of scales of unusual delicacy, and other apparatus needed, I take this occasion gratefully to acknowledge.

In another experiment made on the Jackson Fire-Place quite a strong breeze was blowing into the fresh-air duct from the outside, so that the anemometer recorded an entering current of 70 meters per minute before the fire was lighted. This outside pressure of course increased the effectiveness of the heater, and the saving amounted to about four per cent more than when the air outside was still. This test was made on the very warm evening of June 25, from nine to twelve o'clock, the thermometer outside standing at 25° C. (77° F.). In winter, when the difference between the outer air and that of the flue is lower, a greater saving of heat is realized from any of these heaters, but the experiments lose in accuracy, partly on account of the difficulty of measuring the temperature of the inflowing fresh-air current at the beginning and end of the experiment. The thermometer is influenced by radiation from the surrounding objects in the room, from which it is, of course, impossible to protect it absolutely. If it were possible it would indicate a temperature of over a hundred degrees below the freezing point of water, the temperature of celestial space being, according to Pouillet, as low as −150° C. Only an approximate degree of accuracy can, therefore, be expected, and it is greatest when the temperature of the room is nearest that of the inflowing air currents, as is the case in summer.

The Jackson Fire-Place is at present manufactured in two sizes only. The price of the smaller size, 32½ inches high, and 30 inches wide, requiring a fire-place opening in the brickwork 32 inches high, 28 inches wide, and 15 inches deep, is $60, all nickel plated, or $50, bronzed, or $45, black, with polished basket. The larger size was originally made for rooms 35 by 50 feet. They measure 43 inches high, 38 inches wide (outside of frame), and require a fire-place 40 by 33 by 15 inches. They are to be obtained of William H. Jackson & Co., Union Square, New York.

THE HÔTEL DE VILLE, PARIS. — At one time last May no fewer than 1,098 men were engaged on this building.

CORRESPONDENCE.

THE NEW CITY-HALL INVESTIGATION CONTINUED. — FALL OF A SCAFFOLDING. — POPULAR AGITATION OF THE SEWER-GAS QUESTION.

CHICAGO, August 6, 1879.

BEFORE continuing the account of the city-hall investigation, it is well to describe the present condition of the city-hall and that of the county building adjoining.

The city of Chicago once rejoiced in a public square of about 350 feet in each dimension. In the early days of the city, — that is to say, about twenty years ago, — this spot of ground sufficed for a county court-house, one half of which was used as a city-hall, and a grass plot surrounding it. Two wings were subsequently built, and were supposed to be fire-proof, — one on the east side for the county and the other on the west side for the city. These wings, with the old building, covered the central portion of the square running east and west and from street to street. Two small parks, or court-yards, were left on the north and south sides. But the fire burned up everything contained in these buildings, and utterly destroyed the original structure and one of the wings. The partnership arrangement between Cook County and the city of Chicago, which is of long standing, still exists, so that when it became necessary to build a new court-house and a city hall it was decided by an agreement between the city and county to place them exactly as before. It was also necessary to cover the whole square, and after the two governments had failed to agree upon any plan for a uniform building, the county commenced its own building on its own half of the ground. This compelled the city government to erect a similar building on its half, which it is now doing; and this building is the bone of contention between two rival factions of stone contractors.

Meanwhile the two governments have agreed to erect a connecting building or rotunda between the two, and this is about to be commenced, instead of the immensely tall dome which was designed by the county architects.

The county building is now a basement and four stories high, and some of the work has already been carried up nearly 100 feet above the street grade. It is built of white Lemont limestone and polished Maine granite. It has required more polished granite than any other building ever erected in America, at a cost of nearly $300,000. For the benefit of your Eastern readers I will add that the white limestone, after it has been a short time exposed to the weather, has much the appearance of the limestone of Caen, France, but is very much harder.

The city-hall is being built of a very light gray limestone from Indiana, known as Bedford stone, while the portions which are of polished granite in the county building are of a darker gray limestone, affording a very slight contrast. The Lemont stone is a stratified and laminated stone, but is from a quarry which yields stones three feet in thickness. The Bedford stone is what the stone-cutters call "liver rock;" that is to say, it is not laminated, but the stone of each layer in the quarry is almost homogeneous. The Bedford stone is oölitic, and the Lemont is a shell limestone.

The Bedford stone is very uniform in color and texture, and may be quarried in any size desired. The only defect in it which is general is that an occasional shell or calcareous insect entering into its formation is soft, and after cutting develops what the stone-cutters call "sand-pockets." These would hardly be considered as defects in large pieces, except for the fact that stone-cutters are in the habit of stopping them with cement, which draws attention to them. The Lemont stone contains dark blue or black lines, which with one year's exposure become of the consistency of dry clay. Besides these it contains fine seams, which only an expert can detect in the quarried stone, but which become painfully evident often when a stone has been half cut.

The city-hall is now built up to the top of the main story, which (counting the basement, which is entirely above the street grade, as a story) makes it two stories high. The outline is the same as that of the county building, and the stone-work is of similar design, with the omission of some elaborate work on the rusticated stones of the main piers, and a reduction in the projection of these rusticated stones.

In my last letter I brought the description of the city-hall imbroglio down to the presentation of the supplementary report of the experts. The private report of Mr. Kirkland, the present superintendent of buildings and acting architect, which preceded the report of the experts, was not made public until Monday, August 4, the mayor having retained it until the experts had made their supplementary report. His call for this seems to have been inspired by Mr. Kirkland's report. As was intimated before, the main point made by Mr. Kirkland was in relation to the hollow piers; he also advised that the piers which did not contain bond-stones be taken down in the first and basement stories. These comprise the narrowest piers on La Salle Street and on the opposite side, towards the court between the city and county buildings. These are not such piers as are used under business buildings, and are not isolated. They are piers between windows and are composed on the outside of blocks of rusticated ashlar. On each side of these are the stone window-jamb pieces, and behind them is the brick backing. The piers have an area of about eight superficial feet, and their height is equal to the height of the windows. On the court side they stand singly

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and between much larger piers, whose strength is not questioned except in two places, where there are two intermediate piers so that there may be three openings in a bay. About half of the horizontal areas of the piers are of stone. Gilmore's tests made for the State-House Commissioners of Indiana show that this is one of the strongest magnesian limestones. From these rough data the reader may be able to realize what one of the chief points of dispute is.

Mr. Kirkland's opinion on the hollow spaces in the large exterior buttresses is based on the assumption that the foundations were calculated to sustain the weights of solid buttresses, and that hollow spaces not only weaken the piers but reduce the weights which will be necessary to make all the piers settle evenly, the estimated pressure being three tons per superficial foot at the bottom of the concrete. If these buttresses are solid they will be masses of masonry of about ten feet in dimension each way, and there are about ten of this kind in the building.

It is the opinion of good judges that the lighter intermediate piers are not likely to settle away from the heavier ones, in such a building as this, by reason of exerting a greater pressure per superficial foot of foundation. The horizontal pieces of walls, or transoms of heavy masonry which connect all the piers of such a building as this on every story, have a great sustaining power as masonry beams; and when there is the least tendency of small piers to settle away from larger ones the extra weight is immediately transferred to the large piers by these rigid transoms. If, on the contrary, the larger piers should have a tendency to settle unduly, their weights would be transferred to the small ones, and the tendency would be to bring upon them more weight than they would naturally carry in a building which settles evenly. In view of the fact that these small piers are the very ones whose strength is questioned, it would seem that the lightening of the larger ones was just what was needed to make their reconstruction unnecessary.

The question as to the utility of bonding composite piers, or those composed partly of stone and partly of brick, has been pretty freely discussed by a number of experts who have been giving testimony this week before the Committee on Public Buildings, to whom the experts' report has been referred. Opinions vary. Some contend that the bond-stones were necessary, in addition to anchors, to give homogeneity to the piers, while others hold to the opinion that they are of no use, for the reason that the brickwork will contract and settle more than the stone-work, and consequently that the bond-stones will ultimately have little bearing on the bricks. They even go so far as to say that bond-stones in such piers are liable to be broken.

The committee has thus far taken a great mass of testimony, and is still engaged at it. Most of the stone-cutters who estimated in competition for the work have been called, and with the exception of Walker, the contractor for Lemont stone on the county building, they agree that but one set of plans was estimated upon, and that the building is being built substantially according to those plans. One of them, Patrick Fanning, flatly contradicts one of the expert committee, who testified that Fanning had told him he could not get access to the plans that the successful bidder figured on. This same expert also admitted that he had consented to his name being used as a candidate for Mr. Cleaveland's place. In fact, four of the experts admitted that they had been candidates.

The witnesses thus far called have been mainly contracting stone-cutters and masons, while all of the experts have been examined. In their testimony they agree that only five of the stones in the building should be removed. The concurrent testimony of most of the witnesses goes to show that the brickwork is much worse than the stone-work, and that the grade of bricks specified has not been used; also that many long anchors have been omitted; but the opinions differ as to the utility of these anchors.

The experts in their testimony adhere to the opinion that all the small piers without bond-stones should be taken down. But up to the present time no witness has offered any calculation of the weights to be imposed on these piers, or of their actual present strength, and no one has been asked for any. One of the experts admits that he never made any, yet he says the piers ought to be rebuilt. From these facts it can be seen how little intelligent research has entered into this investigation, and how barren it is likely to be in valuable results.

Still the daily papers are hammering out editorials about it, based upon scraps of testimony which give plausible advantage to one side or the other, and to-day the *Times* shows up the political animus in the whole thing by charging the party now out of power with the responsibility for all the faults that have been committed.

To-day the whole city was shocked by the announcement that a part of the staging in the interior of the new Music Hall had fallen, and four men had been either mutilated or killed, with a probability that all would die. The walls had reached the proper height for placing the wrought-iron trusses. Six men were on the scaffold, which was as high as the top of the wall, and were moving a cast-iron bed-plate weighing five hundred pounds, when the whole thing fell. Two of the men clung to the top of the wall, and were saved. No investigation has yet taken place.

The Chicago *Times* has for some time been agitating the question of house-drainage, and calling attention to the dangers to be apprehended from sewer-gas. A large space is given to the subject every day, and the articles are many of them sensational and alarming. But they cannot fail to call the attention of many who could not otherwise be reached, to the importance of observing sanitary laws in house-drainage. Some of the articles are ably written, but they are mainly a *résumé* of what has often appeared in the columns of the *American Architect* and the *Plumber*.

The *Times* reporter and the sanitary inspector caught one of our oldest architects introducing drain pipes under the air-chambers of hot-air furnaces in a row of new houses now being constructed. They were branches from a sewer, furnished with running traps and having openings and iron grates in the pits under the furnaces. They were introduced to prevent the pits, which were below the cellar floor, from becoming flooded.

THE ILLUSTRATIONS.

DESIGN FOR A COLLEGE BUILDING. MESSRS. WARE & VAN BRUNT, ARCHITECTS, BOSTON, MASS.

ST. PAUL'S LUTHERAN CHURCH, SPRING GROVE, PA. MR. J. A. DEMPWOLF, ARCHITECT, YORK, PA.

This church, now building, is located on the line of the Frederick Division of the Pennsylvania Railroad. The base of the building is blue limestone, and the superstructure of native brick with string-courses of Ohio-stone. The interior is finished in butternut, and the ceiling ribbed, the panels being plaster. The choir gallery, with robing room under, is arranged in the rear and separated from the chancel by a screen backed with red cloth. The building, including Sunday-school room, will accommodate four hundred and fifty people, and will cost, complete, $10,000.

THE HYPÆTHRAL QUESTION.

To the Editor of the American Architect:

Dear Sir, — Since you have made Mr. Clarke's essay on the Hypæthral Question *publici juris*, by reprinting it in your journal, there is, I suppose, no reason why I should not subject it to a little criticism. I am very sorry that that criticism must be unfavorable; but I must say at once that I cannot regard the essay as in any way a valuable addition to the literature of the subject. It does not bring forward a single new fact or testimony, or help us by any new argument to interpret those already known. On the contrary, the author sets out with an assumption selected, apparently, because it is opposed to opinions generally held by those most competent to deal with the subject, and then endeavors to maintain it at all hazards.

In truth, Mr. Clarke has no clear notion of what the Hypæthral Question is, or, at all events, he has not been able to state it. Although he tells us that "the hinge upon which the entire matter has turned is a notoriously obscure passage" in Vitruvius, he, from the first, loses sight of what is asserted in that passage, namely, that certain decastyle, dipteral temples had in the interior "*columnas in altitudine duplices*" (two ranges of columns, one above the other), and that the middle portion, enclosed within these, was open to the sky; so that instead of asking whether this is or is not true, he puts the entirely different and general question: In what manner were the temples of the Greeks lighted? The irrelevancy of this question will be felt when it is remembered that there was but one decastyle, dipteral temple in all Greece, and that it was not a Greek but a Roman temple, virtually built by a Roman architect, and dedicated by a Roman emperor. That no general answer can be given to the general question Mr. Clarke shows by meeting it with a particular one. "I believe," he says, "*all*[1] the light in the interior of the *larger* Greek temples to have been artificial," thus answering the question: How were the *larger* Greek temples lighted. On the question, as thus stated, the passage from Vitruvius has no bearing; nevertheless Mr. Clarke, supposing that it has, proceeds to undermine the Roman architect's authority, and by arguments which are entirely unfair. He tells us that the passage in question is "notoriously obscure," that its author "wrote more than four centuries after the decline of Greek architecture" about things he had never seen, and that he treats them in so bungling a way that "it has been possible to argue with no little force that Vitruvius did not write during the reign of Augustus, as is generally assumed, but, on the contrary, that he did not live in antiquity at all, but was a monkish compiler of the Middle Ages."

Now, it is not true in any sense that the passage from Vitruvius, in so far as it relates to the point at issue, is obscure.[2] It is perfectly explicit, clear, and unequivocal. The only difficulty (and, as I shall try to show, it is not an insurmountable one) is in the last sentence, in which he undertakes to cite an example of an hypæthral temple answering his definition. That Vitruvius wrote more than four hundred years after the decline of Greek architecture is so far from true that he wrote less than four hundred years after its period

[1] This surely overshoots the mark. That even in the largest temples *some* light would enter through the doorway is certain. No one doubts that the smaller temples, like that of Themis at Rhamnûs, of Apollo Pythius at Sikinos, or of Athena Niké at Athens, received their light through the entrance. It would be interesting to know what dimensions were deemed necessary for a "larger" temple and the *entire* seclusion of sunlight. This is but one example of the vagueness that characterizes the whole essay.

[2] The whole passage, with the exception of the last and only difficult sentence, is evidently a literal translation from the Greek. This is shown most plainly by the use of *vero* or *autem* = *δέ*, in every sentence. It may, in the original, have read thus: *'Ο δὲ ὑπαιθρος δεκάστυλος μὲν κατά τε τὸν πρόναον καὶ τὸν ὀπισθόδομόν ἐστιν, τὰ δὲ λοιπὰ ἔχει πάντα ὁμοια τῷ διπτέρῳ, ἀλλ' ἔνδον κίονας διπλοῦς τὸ ὕψος, ἀπὸ τῶν τοίχων ἀφεστηκοτας εἰς περίπατον ὥσπερ αἱ στοαὶ αἱ τῶν περιστύλων. τὸ δὲ μέσον ἐν ὑπαίθρῳ ἐστίν, οὐκ ἐχον ὄροφον, θυρῶν δὲ εἴσοδος ἀμφοτέρωθεν κατά τε τὸν πρόναον καὶ τὸν ὀπισθόδομον.* The *porticus peristyliorum* finds its explanation in a passage of Pausanias, VI. 25, 1, where he speaks of a temple, *στοαῖς ἐν κύκλῳ περίστυλος.*

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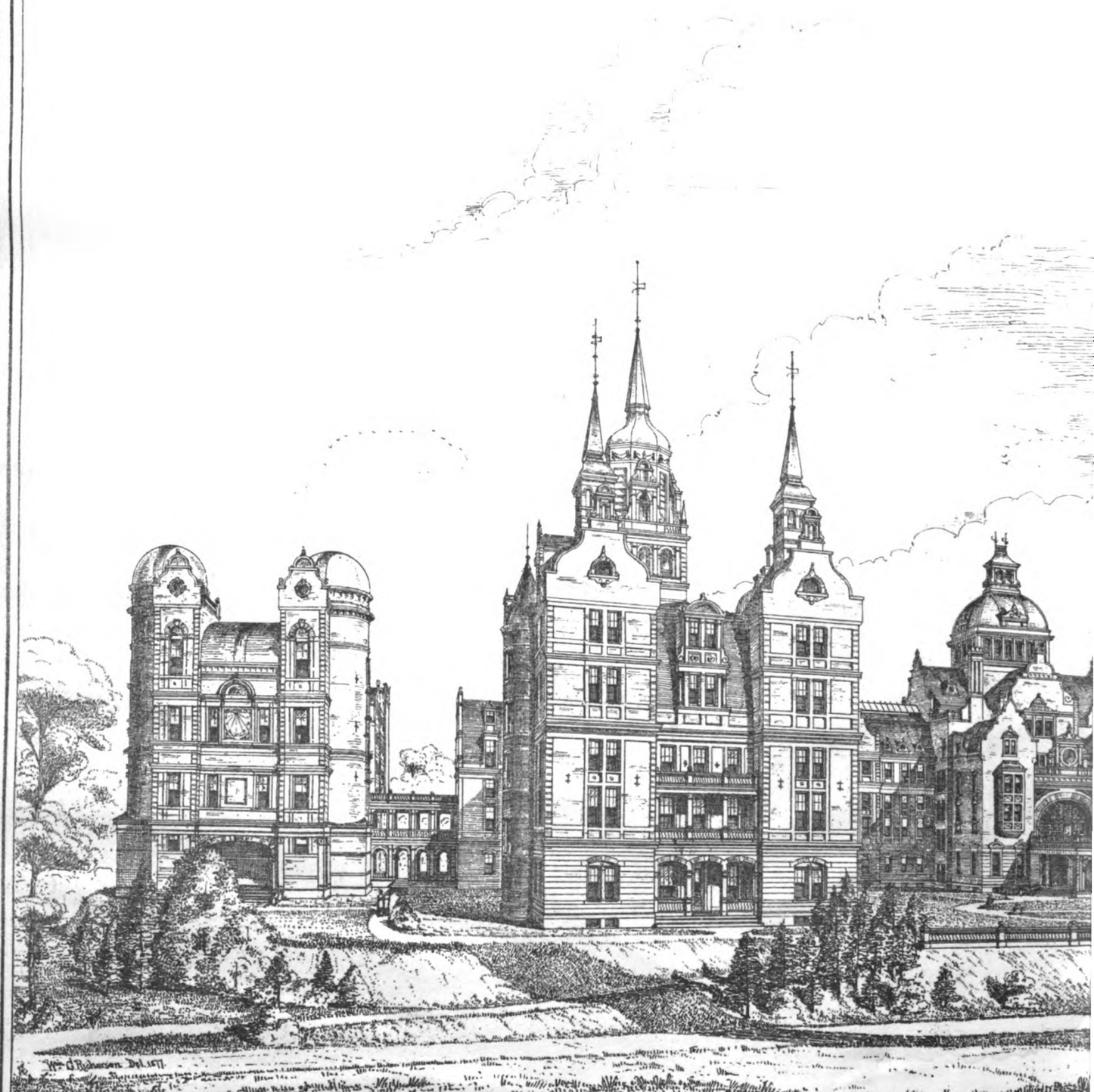

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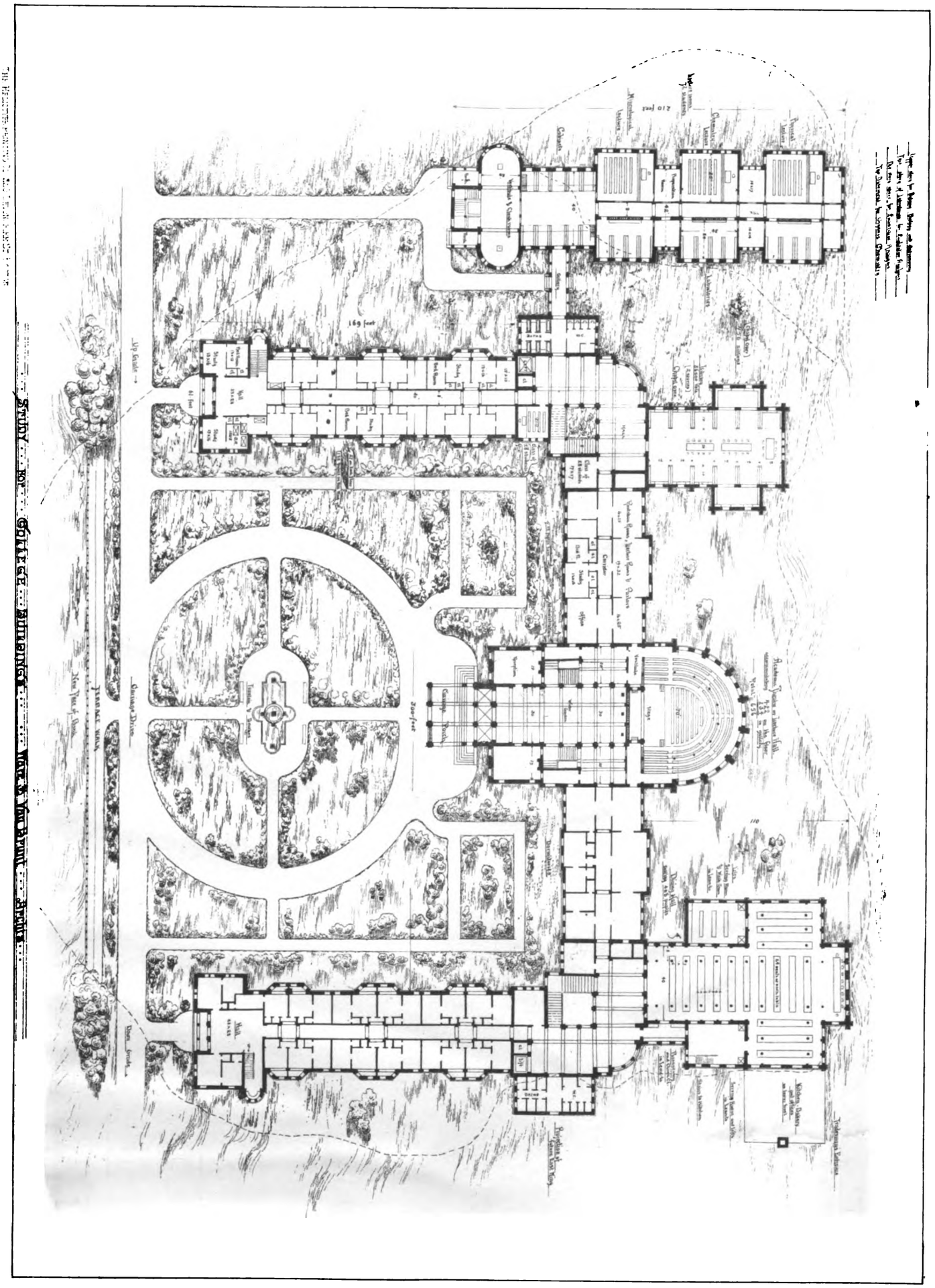

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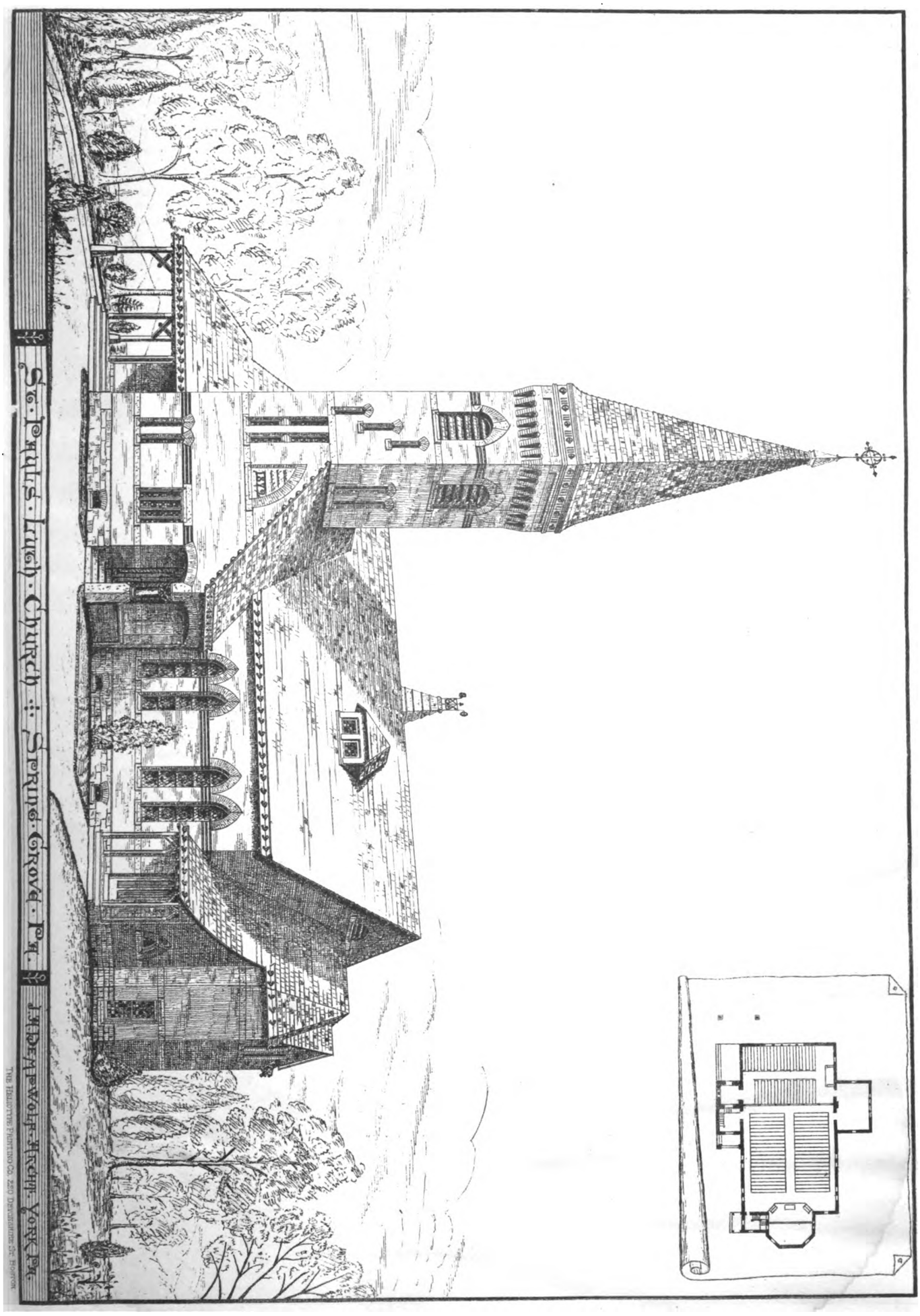

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of highest development, at a time when nearly all the great buildings of that epoch could still be studied as well as on the day they were finished. That Vitruvius had not visited Greece and seen its famous temples is a pure assumption, resting on no authority whatever, and certainly not countenanced either by what he tells us of his education and means (Bk. VI., pref.), or by his evident familiarity with Greek and Greek authors. That Herr Schultz has found it possible to argue that Vitruvius was a monkish compiler only proves what utterly wild theses a German is capable of maintaining. The value of his arguments may be estimated from the fact that there are extant manuscripts of Vitruvius's work, older than either of the dates assigned to him by Herr Schultz, and that he is referred to more than once by Pliny the Elder, who was almost his contemporary. Mr. Clarke's remark on the possibility of error in the manuscripts of Vitruvius is very amusing.

Notwithstanding the "notorious obscurity" of the last sentence in the famous passage from Vitruvius, Mr. Clarke sees that it *may* refer to the temple of Olympian Jove in Athens, and is at pains to show how the author might have been led into falsely supposing it hypæthral. He says: "The Athenian temple of Olympian Zeus happens to have been without a roof in the time of Augustus." This is another baseless assumption. We know nothing about the matter, and, in any case, if the temple had been entirely roofless, it would not have been an example of an hypæthral temple in Vitruvius's sense.[1]

Mr. Clarke having disposed of Vitruvius, and what he supposes to be testimony of his in favor of the hypæthral lighting of the "larger" Greek temples, attacks two other testimonies from ancient authors. Justin relates that the priests at Delphi affirmed "that they had seen the god leaping down into the temple through the *culminis aperta fastigia*." Mr. Clarke's only reply to this is: "It is more natural to suppose that the roof seemed to open to admit the god than that it always stood open." We can only ask why? And what would Justin have said had he wished to convey the other meaning? Mr. Clarke must have a strange notion of what is "natural." That a roof should seem to open to admit a god is surely not more natural than that the god should enter by an opening already made. At all events, if Justin had meant that the temple-roof opened to receive the god he would certainly have said so. The passage does not compel us to suppose that the *culminis fastigia* always stood open.

The other passage, which is from Pausanias (V. 11, 4), is more obstinate still, and, in order to be got rid of, requires more reckless treatment. It runs thus: "When the statue [of Jupiter, at Olympia] was at last completed, Pheidias prayed that the god would give some intimation if the work were to his mind, and instantly a thunderbolt struck the floor on the spot where the brazen water-pot with the lid stood down to my time." That the mark on the floor was "near the statue," Pausanias does not say. The whole force of this passage, of course, consists in the fact that Pausanias was shown, on the floor of the great temple at Olympia, what purported to be a mark made by a thunderbolt after the temple was finished, and found no difficulty in believing it. The truth of the legend, and even the genuineness of the mark, are questions of entire indifference. Yet Mr. Clarke thinks he disposes of the passage by saying: "Such miracles do not need, and should not receive, any materialistic explanation;" which is true, but entirely irrelevant, as is the rest of his argument.

Having destroyed, as he supposes, the testimony of Vitruvius, Justin, and Pausanias, Mr. Clarke remarks: "As far as can be judged from the few and scattered remarks of the ancient writers, which touch upon the subject, the idea of the temple interior was connected with that of a complete roof," an assertion which, if correct, would settle the whole question at once. Of these "few and scattered remarks," however, the specimen selected by Mr. Clarke, and therefore presumably the most favorable to his argument, gives us room for grave doubt. It occurs in Strabo, VIII. 3, 30, and runs thus: "The largest of these is the ivory statue of Jupiter made by Pheidias, the son of Charmides, which is so tall that, notwithstanding the enormous dimensions of the temple, the artist would seem to have transgressed the laws of proportion, in giving it a sitting posture, and making it almost touch the roof with the top of its head, so that it gives the impression that, if it were to stand up erect, it would unroof the temple." Now there is not in this passage a shadow of evidence to show that the temple at Olympia had a complete roof. Even the strongest maintainers of the existence of the hypæthral opening never supposed that the chryselephantine statues of the gods were placed under it. It is only fair to Mr. Clarke's intelligence to assume that he did not understand the statements of Strabo, and indeed there is excellent ground for this assumption. The words which mean "almost touching the roof with the top of its head," Mr. Clarke paraphrases: "Appeared almost to touch the uppermost ceiling in contradistinction to that of the lower aisles, the hyperoön gallery." Evidently he thinks that the verb ἅπτομαι may be followed by a dative, and that κορυφὴ τῆς ὀροφῆς may mean "the uppermost ceiling," thereby betraying an ignorance of Greek surprising in one who undertakes to discuss most difficult questions in Greek archæology.[2] But a person with a gift of interpretation uncontrolled by grammar or lexicon has one advantage: he finds grounds and evidences for theories in places where no one else could, and so Mr. Clarke finds in this passage confirmation for a theory that "Hyperoön galleries existed in all the Greek temples which are now assumed to have been lighted from above." Now, when it is remembered that we have no proof that there were galleries (Why use such a barbarous and superfluous word as "hyperoön"?) in any Greek temple save one, and that existing remains rather discourage than countenance the notion of their having been at all common, this seems a good deal of an assumption. It is true that Pausanias speaks of στοαὶ ὑπερῷοι in the temple of Jupiter at Olympia; but it is very remarkable and rather unfavorable to Mr. Clarke's theory, that that temple is the only one which Pausanias tells us was furnished with a permanent means of getting on the roof (ἄνοδος σκολιά). It seems a pertinent question to ask, If the temple roof was entirely closed, and there were no sky-lights in it to attend to, what was the use of the stair? If there were galleries in the Parthenon, for example, it is strange that Pausanias should not have mentioned them. The fact that they are specially noticed in only one temple would tend to show that they were not ordinary features. It is one of the evils of "restorations" in which, of course, all doubtful questions must be arbitrarily settled in some way, that they cause many difficulties to be generally regarded as settled, which are still very far from being so.[3]

After his efforts with the testimonies of ancient writers, Mr. Clarke gives us a number of circumstantial arguments against the "hypæthral theory." The gist of them is, that, if the weather had been admitted into temples through an opening in the roof, it would have been highly injurious to the interior and its valuable contents, especially chryselephantine statues, and that such a large opening as must have existed, if any did, could not have been closed without much trouble. Throughout the whole, Mr. Clarke confounds the question of an hypæthral opening as described by Vitruvius with the more general and different question of the illumination of ordinary large temples from the middle of the roof. All these arguments have as little cogency as the one originally suggested by Ross, that, if temples had been hypæthral, they would have been easily robbed! Are we left to suppose that the Greek temples had no guards or watchmen?

The only positive ground of any seeming weight, adduced by Mr. Clarke in favor of his view, is connected with the Parthenon. "It must not be forgotten," he says, "that the most perfect monument of the Doric style, a temple which is always held to have been a representative of the hypæthral arrangement, and to which the works of Vitruvius are directly applied, was only two hundred years ago architecturally intact, and had suffered but few alterations. There is no reason to suppose that at the time of the fatal explosion, the roof covering of the Parthenon was otherwise arranged than it was when first planned." I must beg Mr. Clarke's pardon. Not only are there reasons for supposing, but there is direct evidence to show, that the roof covering of the Parthenon was arranged very differently in the seventeenth century after Christ from what it was in the fifth century before Him. However intact architecturally it may have been, and however few alterations it may have suffered, these alterations affected radically the very part with which the question under consideration is concerned. In the *Mittheilungen des deutschen archæologischen Institutes in Athen*, II. 1 (1877), there is published a drawing of the Akropolis made in the year 1670, a few years before the "fatal explosion." In this it plainly appears that the only portion of the roof that had not been altered was that of the posticum and opisthodomos, which had probably been entirely of marble from the first. The roof of the pronaos had been removed to make way for the Byzantine κόγχη or apse, while that of the main part of the cella had been considerably heightened. Again, Father Babin, who was in the Parthenon about 1672, tells us, "*On y void trois rangs de voûtes, soutenues de fort hautes colonnes de marbre, savoir la nef et les deux aîles.*" No doubt, it was covered with the original tiles, but neither that fact nor any argument drawn from the state of the Parthenon in the seventeenth century has any bearing upon the question of the lighting of Greek temples.

In trying to undermine the force of the argument in favor of the lighting of temples from above drawn from the Roman Pantheon, Mr. Clarke is singularly unsuccessful, and it is certainly unfortunate for his theory that the only two ancient temples now standing with their roofs on — the Pantheon in Rome, and the small, very old temple, possibly of Hera, near Karystos — both have openings to the sky. Of the existence of the latter Mr. Clarke seems not to be aware.

I cannot stop to refute *seriatim* the whole of the arguments advanced by Mr. Clarke to show that the "larger" Greek temples were lighted artificially, but I cannot refrain from quoting one passage in illustration.

"The poetical Greek architect did not prepare without purpose such a transition from the crude and harsh exterior light [O Helios!] as was afforded by the veil of shade given by the pteroma, — a change, a modulation from one kind of light to another [What other?]. The darkness of the pronaos [When was ever a pronaos dark, and if so, where was the modulation?] was the preparatory dissonance which intervened between the common and varying light without, and the soft and rich artificial illumination within. One

[1] That the temple was not finished is certain; but, as we know, a Greek temple was hardly half finished when every stone and beam was in its place.

[2] This worse than school-boy blunder is not the only one Mr. Clarke makes in his essay. He writes ὑπαίθρα for ὕπαιθρα, thinks ἐκ σκοτίων μυχῶν may mean *out of dark temples*, uses the utterly impossible word *epinaos*, and follows bad authority in writing *octostyle* for *octastyle*.

[3] Mr. Wood has restored the Ephesian temple of Diana, giving it galleries, and placing the Niobe group in one of the pediments. This is restoring, with a vengeance!

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cannot believe [Why not?] that he who had traversed the wildest part of the Attic landscape to offer vows to Nemesis [Who ever did? One need not traverse much wild landscape to reach Rhamnûs], who had wound his way through dense Arcadian forests to supplicate at the mountain seat of the healing Apollo [The dense forests exist only in Mr. Clarke's imagination; there is no proof that pilgrimages were ever made to Bassæ, and Apollo Epikourios is not the "Healing Apollo"], found himself in an enclosed court [Who ever supposed so?] lighted by the passing mood of the day, whose heat may have oppressed, whose gloominess have saddened the traveller [in a temple 4,000 feet above the sea-level! How Christians in their churches must suffer!]; but rather at a shrine illuminated by tranquilly burning flames, separated from all outer influence, whither no excessive wind [Wind does not generally blow excessively through a vertical opening] or heat, no rain or other baneful effect of nature [When were wind, heat, and rain baneful effects?] could penetrate, where no harsh sound of passing bird or beast, no disturbance of the outer world could interrupt the sacred peace." [1] (How morbidly sensitive the Greeks must have been, and how easily jarred by the outer world!) "In larger temples the case was otherwise, and a brilliant and splendid illumination was often necessary." (Was not the temple at Bassæ one of the "larger" temples?) [2]

This is simply a specimen of the subjective method — the worst of all methods — of dealing with questions of fact belonging to remote ages. A theory that needs such arguments to support it must be very helpless indeed, and the fact that they are needed furnishes an argument by no means weak in favor of a different conclusion. The truth is, Mr. Clarke, without any very considerable acquaintance with Greek or original authorities, has arbitrarily adopted an unpopular theory, and striven to maintain it by subjective arguments, and notions borrowed from German guessers, than whom there are no more untrustworthy guides. His mistake was in taking up the subject at all; for we ought at once to admit that we have not sufficient grounds for any theory whatever on the lighting of the large Doric and Ionic temples of Greece, or even for saying that they were in every case lighted at all, otherwise than through the doorway. At the same time it is true that what little evidence we have goes against the notion of an "hypæthron," such as Vitruvius assigns to certain decastyle, dipteral temples, and yet in favor of lighting from above.

I will enumerate a few facts, which, if steadily borne in mind, may help to render future discussions of this subject easier.

1. The famous passage of Vitruvius (III. 1) has no bearing upon the question of the lighting of Doric and Ionic temples in Greece. [3]

2. Temples open to the sky, particularly temples of Jupiter, were not uncommon in Greece, or even in Italy. See note to 1.

3. Temples of the size of those of Jupiter at Athens and Selinus, it would have been next to impossible to roof over, and we have the express testimony of Strabo that the temple of Apollo at Branchidæ remained without a roof on account of its size (*διέμεινε χωρὶς ὀροφῆς διὰ τὸ μέγεθος.* XIV., p. 634.)

4. The great Eleusinian temple (*τελεστήριον*) of the Chthonian deity Demeter, in which the mysteries were performed, and from which, if from anywhere, we should expect light to have been excluded, had an opening in the roof (*ὀπαῖον*), according to the express testimony of Plutarch (Periklês, XIII. 5).

5. The Doric temple of Jupiter Capitolinus [4] at Rome had an opening in the roof over the statue of Terminus (see Beulé, *Histoire de l'Art Grec avant Périclès*, p. 294, and references there given), and other temples of Jupiter must have had similar openings, if we may trust the testimony of Varro. [5]

6. The smoke and heat of numerous lamps, burning in a temple with a closed roof, would have done as much damage to pictures and chryselephantine statues as an occasional shower of rain. Ancient wall-paintings were almost weather-proof.

7. The presence of burning lamps in temples does not prove that they were used for illumination.

8. People who could rear a Parthenon must have been able to provide for opening and closing large orifices in its roof.

9. No arguments based upon modern æsthetic notions are of any weight in determining the appearance or arrangement of an ancient temple-roof. [6]

10. In the Pandroseion, or western part of the Erechtheion, there grew an olive tree, [7] which would hardly have been possible in a temple from which the sun was excluded. Artificial lighting does not answer well for trees.

There are other facts which might be adduced in favor of the view that Greek temples were, in many cases, lighted from above; but these will perhaps suffice, when it is remembered that not one fact can be brought forward in favor of artificial lighting.

I am, dear sir, truly yours,

Thomas Davidson.

SLOW-BURNING CONSTRUCTION.

To the Editor of the American Architect:

Sir, — In answer to your request I will make some comments on E. A.'s letter to you, published July 12. First, however, I must be allowed to disclaim utterly the idea that there is any "issue" or controversy between him and me as to the principles which he advocates. On the contrary, there is no one who would take greater pleasure than myself in seeing those principles generally followed, and it is solely with the hope of promoting that end that I remark upon points wherein my experience, or that of others, differs from his, so that when, through the efforts of underwriters I hope, the public shall have been so far brought to realize the enormous losses it suffers through its present penny-wise and pound-foolish habits of building as to call upon architects for more durable constructions, the latter shall, so far as my suggestions go, have their attention called to the difficulties as well as to the advantages of the improved methods, and thus be saved from bringing discredit upon a valuable reform, and perhaps heavy loss upon themselves or their clients, by too hasty inductions from facts which need to be considered with relation to every part of the complex modern structures. I have a vivid recollection of a certain sanitary reform, which, carried away by the description in the writings of some English engineer, I introduced in a house built under my care. The improved arrangement accomplished, perhaps, all that was claimed for it, but there turned out to be incident to it also some objectionable features, about which nothing was said in the description, and these grew to be so serious that within a few months I had the plumbing rearranged on the old system at my own expense, and it is to save others from similar mishaps that I consider it necessary to call in question assertions and theories which seem to me to be doubtful.

E. A. asks what authority there is for supposing that enclosing timber in plastering causes dry-rot, and says that he has not found that to be the case. He thinks that there may be a porosity in plaster which admits a certain quantity of air to the wood and preserves it from the effects which are well known to follow from enclosing it with an impervious covering.

In answer to the question I only cite those authorities which I have immediately under my hand.

The late R. G. Hatfield, one of the best constructors of our time, says, in a paper read before the Eleventh Convention of the American Institute of Architects: —

"This defect" (the combustibility of ordinary flooring) "in the construction of wooden floors has led to various devices, one of which is the use of plaster or gypsum, which is thickly spread upon the lathing at the bottom of the opening between the beams, and also extended up on each side. This forms

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[1] We compare this with another passage in which Mr. Clarke says of the "hypæthron" of the Roman Pantheon: "Its retention was natural, and in many respects satisfactory. It gave a sufficient and comparatively unvarying light to the dome by omitting a part of the vault, the incumbent weight was diminished, while the supporting and enclosing walls were left unpierced, thus retaining their ideal character of securing entire separation and isolation from the world without." So it seems the light was more unvarying, and the outer world more easily excluded amid the bustle of imperial Rome than on the lonely heights of the Arcadian mountains!

[2] It is curious that of this very temple a fragment was found which seemed to belong to the cornice of an opening in the roof. The roof, we know, was of marble.

[3] On the strength of the last "notoriously obscure" sentence of this passage it has been attempted to extend the Vitruvian "hypæthron" to such octastyle peripteral temples as the Parthenon. For this there is no good ground; for, whatever the sentence may mean, an octastyle peripteral temple can never be adduced as an example of a decastyle dipteral one. There is an explanation of this difficult passage, which, as far as I can discover, has not struck any scholar, and which, nevertheless, would, I think, make it at once consistent with what goes before, and give an intelligible meaning. The sentence reads thus: "Hujus autem exemplar Romæ non est, sed Athenis octastylos et in templo Jovis Olympii," with a various reading of *est* for *et*. If now we bear in mind that the word *ὕπαιθρος* was not used in Greek till long after the time of Vitruvius as an adjective, but always as a substantive, we shall see how it might have come to be used as an architectural term to designate an open-air shrine, such as those which undoubtedly existed in Greece, most of them sacred to Jupiter. Vitruvius himself (I. 2, 5) tells us that conventionally "*Jovi* Fulguri et Cælo et Soli et Lunæ ædificia *sub divo hypæthraque constituuntur*" (Mr. Clarke has not ventured to attack this testimony); and we hardly need the assurance of Maximus Tyrius, *Dissert*, VIII. 1, to prove to us that Jupiter, the god of the sunlit sky, was originally worshipped under the open vault of heaven. Pausanias not only mentions a temple of Zeus that had no entrance, and whose contents could, nevertheless, be seen from without (*περίβολος δέ ἐστιν ἐν ταύτῃ [τῇ ἀγορᾷ] λίθων, καὶ ἱερὸν Αυκαίου Διός· ἔσοδος δ' ἐς αὐτὸ οὐκ ἔστι· τὰ γὰρ ἐντός ἐστι δῆ σύνοπτα*), but of all the temples which he mentions as roofless (*οὐκ ἔχον ὄροφον* — seemingly his expression for "hypæthral"), without stating that the roof had been destroyed or had decayed, there is, I believe, only one which is not a temple of Jupiter, and *it* is a Metroön. (Cf. I. 40, 5; II. 24, 4; VIII. 44, 3.) It seems moreover capable of proof that the shrines and altars of *Ζεὺς ὕνατος* and *Ζεὺς ὕψιστος* were always open to the sky. Suppose now that it was an established rule, a *θεματισμός*, as Vitruvius would say, that this should be so, that the shrine or *ἱερόν* of Zeus Hypatos should be an *hypæthros*, and suppose that his worshippers, nevertheless, in return for some special favor, wished to show their gratitude by dedicating to him a permanent temple; what could they do other than erect an edifice round the *hypæthros*. But the *hypæthros* would still remain the *ἱερόν*, and the *ναός* would be merely a splendid enclosure for it, a kind of double porch running all the way round it. And this corresponds exactly with the description given by Vitruvius. If now we give *hypæthros* this its proper meaning, and read *est* for *et*, the passage becomes perfectly clear, and the meaning is: Of this (hypæthros) there is no example at Rome, but there is one with eight columns at both ends *in* the temple of Olympian Jove at Athens. I put this forward merely as a conjecture. Whether there is any proof that the "hypæthros" of the temple referred to was octastyle, I do not know.

[4] There is no need to suppose that this temple was "hypæthral," and indeed we have the express testimony of Vitruvius that there were no hypæthral temples at Rome in his time.

[5] Why Mr. Clarke, who promises not to omit "to consider any argument or testimony in favor of the hypæthron on which weight has been laid by its advocates," has taken no notice of the testimonies referred to in 2, 3, 4, and 5, I do not understand. He has given the weaker testimonies and omitted the stronger. Was he unacquainted with the latter?

[6] How true it is that modern æsthetic notions are no guides in questions of Greek art is shown by the fact that until recently critics scouted the idea that the Greeks should have had painted temples or statues; yet now no one can doubt the fact. Mr. Clarke, however, is surely wrong when he says (p. 26) that æsthetic considerations have prevented most "hypæthral restorers" from clearly showing "their intention by adequate illustrations." The "hypæthron" is an extremely common feature in restorations.

[7] I make this assertion in full consciousness of the theories of K. O. Müller, A. Michaelis, and others. Müller places the olive in the open porch of the Caryatides, which is plainly wrong, since that porch is merely a covering for a stair, a *Treppenhaus*, as the Germans say. Michaelis, in defiance of the evidence, places the tree outside the building altogether. To the direct statement of Herodotus that the olive and the sea were *in* the temple (*νηὸς, ἐν τῷ ἐλαίη τε καὶ θάλασσα ἐν*); more explicit words it would be impossible to find), he coolly remarks, "*Vielmehr wird Herodot's Ausdruck etwas ungenau sein!*" Of course, he knows better than Herodotus. The almost equally explicit testimony of Dionysius he sets aside in a still more arbitrary way, defying both grammar and lexicon. But what are texts, however explicit, to a German when he has once embraced a notion? That Michaelis's restoration of the Erechtheion is entirely wrong is proved by the concordant testimony of ancient authors and by the ruins themselves, which show that the building was not two-storied, as indeed no Greek temple was, except one of Aphrodite at Sparta. (Paus. III. 15, 8.)

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a good filling, effectual in preventing the draught of air, but it has been found to *induce rapid decay of the timber*, and is therefore a failure."

Viollet-le-Duc, another good authority, says (*Dict. Rais.*, Art. PLAFOND) : —

"Des bois laissés à l'air sec peuvent se conserver pendant des siècles; enfermés dans une couche de plâtre, surtout s'ils ne sont pas d'une entière sécheresse, ils travaillent, fermentent et se reduisent en poussière. Nous ne croyons pas nécessaire d'insister sur ce fait bien connu des praticiens." [1]

And in another place (Art. BOIS), speaking of mediæval carpentry : —

"Les planchers se composaient d'une série de poutrelles ou solives apparentes recouvertes d'une aire, sur laquelle on posait le carrelage; les pans de bois laissaient voir leur deux faces intérieure et extérieure. Dans cette situation la durée des bois est illimitée, tandis qu'ils s'échauffent, fermentent et se pourissent avec rapidité, lorsqu'ils sont complétement enfermés. Tous les jours nous voyons des planchers qui n'ont pas plus de vingt et trente ans d'age, dont les solives sont totalement pourris. On objectera que ces planchers ont été exécutés avec des bois verts; cela est possible. *Mais nous avons vu des poutres de planchers restées apparentes pendant deux ou trois siècles en parfait état, se pourrir en quelques années lorsqu'on les avait enfermées dans des enduits:* ce n'est donc pas seulement à la verdeur des bois qu'il faut attribuer leur décomposition lorsqu'ils sont enfermés, mais au défaut d'air, qui produit leur fermentation." [2]

Rankine (*Civil Engineering*, p. 449), says : —

"Slaked lime hastens the decay of timber, which should therefore in buildings be protected against contact with the mortar."

These, with the many other authorities which may be consulted on the subject, will perhaps suggest caution to inexperienced architects in such cases as those of which E. A. speaks; if so, the advance of the art of good building will, I think, be rather promoted than hindered.

Perhaps I may have misunderstood E. A. in supposing that he referred to the coating of the timber with plaster *in contact* with it. Having had the pleasure of examining a mill built under the control of his company, I found that the plastering, which was put on wire lathing nailed to three-eighths furring-strips applied to the sides of the beams, merely clung to the wire, not having been pressed through strongly enough to reach the timber, except in occasional spots. There was, therefore, a space of one eighth of an inch perhaps between the wood and the inner surface of the plaster, giving, in the intervals between the furring-strips, unobstructed channels for the circulation of air along the sides of the beam. This may have been what he meant by "enclosing timber in plastering." If so, it is not strange that it should be preserved, but there may be others who, like myself, understood him to refer to the complete coating of the wood with mortar, as for instance in the case of the partition described in General Meigs's letter to you not long ago. If he knows of instances of *that* kind, where heavy timbers have remained sound, say for twenty years, perhaps he will kindly furnish you with notes of them.

Before we leave the interesting subject of dry-rot, it may not be amiss to remark that paint, although it may, and often does, cause rot by preventing the evaporation of the natural or acquired moisture of the wood, as where shingle roofs are painted when first put on, or where basement floors are covered with oil-cloth, or in the cases which E. A. mentions, is yet very useful in preserving timber, where it is so applied as to exclude moisture from without, especially from the end grain of the wood. Thus good carpenters often paint the ends of clapboards before putting them on, that they may not absorb dampness from each other or from the casings and corner boards, and some architects paint the under side of the sills and the ends of the girders in wooden houses, to preserve them from the humidity of the cellar walls. In fact, the so-called ventilation of beams, which consists usually in leaving a space of an inch or so at the end, while the sides are closely built up, has always seemed to me to owe its undoubted good effect much more to the separation of the damp masonry from the ends of the capillary tubes of the wood than to any possible effective circulation of air about it.

E. A. quotes a letter of Mr. Waters, Vice President of the Clinton Wire Cloth Co., saying that "it is a chemical impossibility that the presence of plaster of Paris in gauged mortar can work as a corrosive on iron." You will perhaps allow me to make a few comments upon this assertion, which totally contradicts what we are accustomed to consider the best authorities, as will be seen from the following quotations.

Mr. Hatfield, in the same paper on fire-proof construction from which I gave an extract above, says, "This latter material" (gypsum) "is *active in rusting iron, and should therefore not be allowed to come in contact with it.*"

Ramée (*[illegible]tique*, p. 92) says : —

"Si le plâtre est mis en contact avec le fer, *il en détruit la qualité* au moyen de l'acide sulfureux, *l'oxyde fortement*, et cela en rapport du temps que le plâtre met à sécher." [3]

The testimony of French architects is particularly valuable, as, aside from their more scientific and thorough habits of observation, they are accustomed to use plaster of Paris very freely.

Rondelet says (*Traité de l'Art de Bâtir*, ninth edition, vol. i., p. 197) : —

"Les fers qui sont scellés dans du plâtre s'oxident beaucoup, ceux qui le sont dans du mortier ne s'oxident presque pas. C'est pour cette raison que les maçons en plâtre se servent ordinairement de truelles à lames de cuivre, ceux en mortier, de truelles de fer. J'ai trouvé dans les démolitions de très-anciens édifices des fers tout-à-fait enveloppes de mortier, qui n'étaient que légèrement oxidés à leur superficie; tandis que d'autres, placés dans des constructions en plâtre, beaucoup moins anciennes, étaient presque décomposés." [4]

I am told of similar cases in the experience of our own architects.

But any one who despises "book-larnin'" on such subjects can convince himself of the corrosive action of plaster of Paris, as compared with lime, by ocular evidence, if he will take two saucers, and, putting a coil of wire or a handful of tacks in each, fill up one with water and calcined plaster, and the other with lime paste. In a few hours the plaster will be stained brown with oxide of iron, while the wire in the lime will remain free from rust, to all appearance indefinitely.

What proportion of lime added to the plaster will neutralize this tendency I do not know exactly, but there is some corrosion even with equal quantities of lime and plaster. Perhaps some one will investigate the subject more fully. Meanwhile it will do no harm for young architects and amateurs to be somewhat circumspect about using gauged mortar on iron lath, or running cornices on wire, if they wish to avoid at least brown stains on their plastering.

In regard to the Boston Theatre ceiling, mentioned by Mr. Waters, Mr. Cabot tells me that the wire lathing was *tarred* before any mortar was applied, and that the lime mortar of the first coat, being well trowelled, practically buried the wire, which was thus doubly protected against the corrosive action of the plaster of Paris.

But this is hardly a practical objection to the use of wire lath in careful hands in those places for which it is adapted, as any good architect or builder would have intelligence enough to protect the metal by whitewash or tar before touching it with plaster; my question about the merits of the wire was not whether it might not be, with due care, admirably adapted to such ceilings as E. A. describes, and to other purposes, but whether it made, by nailing to wooden studs, as good a *partition* as could be obtained in other ways at the same expense, and this, in spite of Mr. Waters's opinion that the wire lath is "cheap," I still doubt.

The price list of the Clinton Wire Cloth Co. quotes their lathing of the lowest grade at thirty-five cents per square yard, let us say, delivered at four cents per square foot, the prices running from that up to sixty-five cents. Mr. Waters says it is easily put on by the average mechanic. That has not been my experience, but we will assume that it costs no more to apply than ordinary lathing.

The studding, bridging, straightening, etc., of a good partition will cost about three cents per square foot. With plastering at twenty-seven cents per yard, which it would be worth on wire lath, perhaps, by reason of the greater quantity of mortar consumed, the cost of the partition with wire lath and plaster on both sides would amount to: studding, three cents; lath, two sides, eight cents; plaster, two sides, six cents; total, seventeen cents per square foot. To compare this with concrete partitions. Mr. Schillinger wrote me some time ago that he would furnish perforated concrete partition blocks on board cars at eight cents per square foot, and that the putting up would cost about three cents more. Similar blocks are made in most of our large cities, so that twelve to thirteen cents per square foot may be taken as the cost of the partition in place. To this must be added the cost of a skim coat of plaster on both sides, but the total is less than that of the studding with wire lath, and the result will be, in my opinion, superior in many respects.

On one other point only I am compelled to say that my opinion differs from E. A.'s, but that is an important one. He says "it is possible that dampness might penetrate walls tied with bricks so as to preclude fine decoration," but he would "infer from the dryness of factory walls laid in half-cement mortar that there would be no such difficulty."

May it not be that his factory walls are built more solidly than those of ordinary structures would generally be, in order to resist the vibration of the machinery? If not, his experience differs from that of most architects. I can assure him that I have seen pails set to catch the water which came through solid freestone from ten to eighteen inches thick, and have been told of a case in Fall River where the rain came through a brick wall *four feet* thick, and ran down on the inside.

The outer wall of a house or hotel, tied to the lining with solid withs of brick under every beam, would hardly be more than eight inches thick, so that it would be easily penetrated in driving storms.

In point of fact, after some little experience with hollow walls, plastered inside, even though laid in half cement, I think I have never seen one which did not show signs of dampness after heavy rains in places where the air-space was crossed by masonry, as it usually is, even in a wall with iron ties, in the jambs of windows and doors. The very mortar which dropped from above and lodged on

[1] Wood exposed to dry air will endure for centuries; enclosed in a covering of plaster, especially if it be not thoroughly dry, it works, ferments, and falls to powder. We do not feel it necessary to insist on this fact so well known to constructors. — EDS.

[2] The floors are composed of a series of exposed beams or joists covered with planks on which are placed the tiles. The inside and outside faces of the timbers are exposed to view. In such a situation the life of timbers is limitless; while they become heated, ferment, and rot rapidly when they are completely enclosed. Daily we see floors not more than twenty or thirty years old whose joists are completely rotten. The objection will be raised that green wood was used in such floors; that is quite possible. But we have *seen floor beams which had endured in perfect condition two or three hundred years while they were left exposed, rot away in a few years when they were enclosed in plastering.* It is not then to the greenness only of wood that must be attributed their decay when they are enclosed, but rather to the want of air, which produces fermentation. — EDS.

[3] When plaster is in contact with iron it destroys the quality of the iron through the agency of sulphuric acid, oxidizes it rapidly, and this in proportion to the time the plaster takes to dry. — EDS.

[4] Iron which is enclosed in plaster oxidizes considerably, while iron enclosed in mortar hardly oxidizes at all. It is this fact which causes plaster-workers to use ordinarily trowels with copper blades, while masons who work in mortar use trowels with iron blades. I have found in tearing down very old buildings pieces of iron entirely enveloped in mortar whose surfaces alone were very slightly oxidized, while I have found other pieces placed in plaster in much more modern buildings which were almost wholly decomposed. — EDS.

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the hoop-iron ties would often conduct the moisture of the outer wall across the air-space into the lining wall, where it showed itself in the plastering, so that in my last specification for work of the kind I have directed that the ties should be set in the vertical joints, so as to present the edges upward, instead of the flat, as is the usual way.

One of your correspondents suggests that horizontal slabs of slate might make good ties. I can inform him that that has been tried, but the moisture which trickles down the inner surface of the outer wall runs over the top of the slate ties and appears in the lining wall. In my opinion, the course of improvement in hollow-wall building should be in the direction of ventilation of the air-space by rapid and continuous currents. In this way we may be able to keep a brick-tied wall dry, and we should diminish the risk from pulmonary diseases, which we are told by the Massachusetts State Board of Health are more to be feared in brick or stone houses than in the dry, wooden ones.

E. A. asks me, in respect to the upper stories of warehouses used only for storage, which is the better way: to use double timbers, eight feet apart, planed and chamfered, with a floor upon them of three-inch matched plank, or the ordinary construction of beams twelve or fourteen inches on centres, with double flooring, and what would be the difference in cost.

Of course, I say at once that the construction with girders covered with three-inch plank is far better than the other mode, and if it were not for the underwriters, who do not apparently notice the difference in making their rates for insurance on the goods stored in such warehouses, it would have before this have become almost universal. But it is not so cheap, and so long as the owner cannot make anything, either in insurance or in rent, by adopting it, he is not likely to do so.

Let us look into the question of cost.

By the building law of New York, and the practice of careful architects everywhere, a specified load per square foot is fixed for the floors of dwelling-houses, places of public assembly, and warehouses of various descriptions, which they may be called upon, and should be able, to bear, with a suitable factor of safety; and the first step of the architect careful of his employer's money is to calculate the exact dimensions and spacing of the beams, and to select the kind of timber with regard to its market price in relation to its coefficient of transverse strength, which will just accomplish the result he desires, and no more. Now the actual bulk of timber necessary for making a floor of given strength, supposing the depth of the beams to be the same, does not vary appreciably, whether it be divided into many thin beams, or concentrated into one or two thick ones. The thin ones, near together, admit of a great practical increase of stiffness by bridging, which is impossible with the widely spaced girders, but that is not allowed to enter into the calculation of the absolute strength of a floor, so I disregard it.

The timbering being therefore the same, we have to compare the three-inch plank covering with a double floor, two inches thick in all. The matching of the plank, which would be necessary to prevent dust from sifting through, would cause three times the waste of stock incurred in matching seven-eighths-inch boards, and in addition, the plank floor contains one board foot more of stock for each square foot of floor than the other. The handling of the planks, the size of the spikes for securing them to the beams, besides the tripling of the waste of all kinds in stock, would, I should say, add as much more. Calling the extra cost of stock for the plank floor one and one half cents per foot, and waste and labor one and one half cents, we arrive at three cents per square foot for the increased cost of the plank floor, without counting any planing of girders or underside of floor, chamfering or other finish.

Now three cents per foot would pay for plastering the ceiling three coats, and my opinion is that until radical changes are made in insurance matters, owners of stores will put their money into neatly plastered rooms which they can rent for salesrooms, in preference to spending the same amount for rough, though slow-burning floors which can only be used for storage, or to spending a considerable additional amount in making the slow-burning construction as attractive for renting purposes as the white plastering now in common use.

E. A. quotes my observation that stud partitions carrying 12 inch by 12 girders or their equivalent would buckle unless interrupted by posts, and asks if he is to infer that I approve of hollow combustible partitions as supports for hotel or tenement-house floors. That would be a singular inference from my remark, but I hasten to assure him that I do not consider stud partitions, common as they are, to be fit supports for any floor, not even when lathed with wire; that I regret the necessity for using them in every case where I am compelled to do so, and do my best by courses of brick to diminish their dangerous qualities, and that I look with anxious eagerness for the time when *underwriters*, by refusing to insure, or discriminating heavily in rates against such constructions, shall make them unprofitable to their owners.

Does not E. A. see that the whole matter lies in the hands of the underwriters? How can architects, except in isolated cases, urge with any force a reform which is of no pecuniary advantage to the public, and will increase their own commissions? Their recommendations would, and do, sound to the public like those of quack doctors pushing the sale of their pills, while underwriters, especially officers of mutual companies, would be listened to with respect. Why should not the Underwriters' Association take the matter in hand, and with the enthusiasm and knowledge of E. A. and a few others like him, for which no one can feel greater respect and sympathy than myself, a reform could speedily be inaugurated, which we architects, whose hands are tied by our compelled attention to the pecuniary interests of our clients, might preach forever in vain. Not only are we prevented from attempting to practise our cherished theories, but to be even known as an enthusiast for good construction would be fatal to an architect's business. For one man who wants a house which he can leave for a day, and be sure of not finding it and his family in ashes when he comes back, there are a thousand who are contented with the old ways, and avoid as a pestilence the architect who, they fear, would try to persuade them to spend money on extra security. All that could be changed if the underwriters saw fit to have it so. I have a vague impression that the rates for dwelling-house insurance on the Continent average about one sixteenth of one per cent per annum, while in this country they would be perhaps five to eight times that. Why cannot the insurance companies establish a system of inspection, and make rates varying from one sixteenth or less up to one per cent, according to the mode of construction? To build a house as secure against fire as the average Continental dwelling would cost but eight to ten per cent more than our common construction, — probably less than that when such improved construction came to be general. If an owner could save eight or nine tenths of one per cent a year on his house and furniture in insurance, he would not be long in adopting the new methods, and the architects would be quick to help him to the best of their ability, which is, I think, greater than E. A. supposes. At any rate the underwriters would have tried to do their part, instead of sitting still and inveighing against poor professional men for not cramming down the throats of their employers methods and materials, not to say designs, for building which they do not want, which it is not for their pecuniary interest to have, and which they will not pay for.

Let them make a little beginning, by enforcing a few precautions either through the persuasion of rates, or by lending their influence to promote the enactment of general building laws, applicable to whole states, and containing simple provisions, such as the prohibition of woodwork within eight inches of the inside of any flue; the compulsory use of trimmer-arches before every fireplace, kitchen chimney, and laundry boiler; the requirement that chimneys shall be plastered throughout on the outside, and shall go straight up through the roof, without those dangerous projections in the form of bases where the chimney leaves the roof, so beloved of country builders, and they will already have accomplished much, and opened the way for more. They may depend upon it that the architects will follow close at their heels, cheering on their clients with portfolios full of sketches and descriptions of the beautiful and picturesque "slow-burning" construction of the Middle Ages everywhere, and of many parts of Germany, Switzerland, and Italy to this day, the books about which, and the recollection of which, strange as it may seem to E. A., form the principal part of the libraries and the most cherished mental treasures of all cultivated architects.

Let E. A. persuade some one to try to build a hotel which shall burn slowly enough to allow the inmates to escape in case of fire without jumping from the windows, and I will answer for it that the architect will overwhelm him with sketches of Swiss chalet floors, of the timber ceilings of Blois and Pierrefonds, Charlecote and Speke, with descriptions of the vaulted rooms of Tuscany, and the half-timbered walls of Germany, and will work twice as hard for that client as he would for the ordinary owner, for the pure delight in the picturesqueness and opportunity for design that the construction gives him, in place of the hateful but cheap smoothness of ubiquitous plaster, to say nothing of his satisfaction in the thought that no one in their death agony, struggling with flames from which they could not escape, would curse him as responsible for their fate.

C.

NOTES AND CLIPPINGS.

The Statues at Menars. — The historical dates of the end of the last century have within the last few days, says the Paris correspondent of the *Builder*, been showered down rather plentifully on the public in connection with the anniversary of the fall of the Bastille, but surely in no stranger manner than in an incident of the sale of the château of Menars, — a château on the Loire which was given by Louis XV. to Madame de Pompadour, and was lately the property of [illegible] de Bauffremont. The estate was knocked down to M. W[illegible]ncillor, for 920,000 francs. But just as the adjudicatio[illegible]ade a courier from the Minister of Fine Arts suddenly appeared, claiming in the name of the Government the famous statues — a collection of *chefs-d'œuvre* — which adorn the gardens of the château; the Minister declaring that he "opposed himself formally to the sale of these statues, precious objects of art, and of great value, which were carried off from the museums of the state in 1792, and placed at Menars, without having ceased, however, to be the property of the Government." The purchaser has appealed to the courts.

A New Architectural Dictionary. — Messrs. W. J. & J. A. Audsley are authors and publishers of a new architectural dictionary, the first volume of which has just appeared at Liverpool under the title of A Popular Dictionary of Architecture and the Allied Arts. It is to be complete in ten volumes. It will include, besides the usual amount of architectural information, papers on heraldry, iconography, mythology, both Christian and pagan, glass-painting, carving, embroidery, illuminating, mosaic-work, and other kindred topics.

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THE testimony before the coroner's jury, in the case of the fatal fall of the scaffolding employed in the erection of the Music Hall, at Chicago, reveals no new facts. The structure, on the whole, seems to have been rather better than is usual in such cases; it was built for the masons, was of double width and of new material. Apparently it was the opinion of the contractor that the primary cause of the disaster was the breaking of a joist, three by twelve, extending from a pole of the staging to the wall, by the sudden impact of the heavy iron bedding-plate upon the foot-planks which it supported. The verdict in very general language pronounced the scaffolding to be "in an unfinished condition, and unsafe for the purpose for which it was used," but that the work at the time was in charge of an experienced and competent foreman, "who erred in judgment in the present case." The jury, which was composed of architects and builders, found fault with the scaffolding, which was reconstructing, on the ground that it would still be unsafe, and called attention to this fact as a warning against future accidents. It is to be regretted, for the sake of the precedent, that those gentlemen did not define the nature of the construction which they found so insufficient, — did not touch upon the alleged misuse in the present case, and advise as to the measures necessary to render it secure. It appears, then, that we can derive no practical lesson from this occurrence except a general warning to be more careful hereafter in the building and in the use of such stagings. Our impression is that more paternal governments, by an arrangement of fines and imprisonment applicable to such cases of disaster, manage to secure a greater immunity than we enjoy. The poor fellow whose temerity in this case was so terribly expiated would not have dared to risk a weight of five or six hundred pounds upon a barrow along any staging, instead of using a mason's derrick, if he had had before his eyes the admonition of a law providing such inconvenient penalties. That is to say, such a law so enforced would have created a habit of prudence which would have rendered such an accident extremely improbable.

THE board of volunteer censors, which generally hovers around any official whose place its members would be glad to fill, still keeps its attention fixed on the Superintendent of Buildings in New York, recently promoted from the position of Deputy Superintende[illegible] Mr. Dudley has the reputation of being less of a politici[illegible]e Pra[illegible] either of his predecessors, and in his performance of [illegible]an con[illegible]ties as deputy he showed intelligence as well as faithfulness to the great responsibility imposed upon him; his promotion was advocated by the best builders of the city, and it would be a public misfortune to have him supplanted by a corrupt official of the old stamp. His theoretical training, and his relationship to the American Institute of Architects, through his father, Mr. Henry Dudley, an old and respected member, are all in his favor. It would be impossible for an officer necessarily clothed with so much arbitrary power as the superintendent, under the New York law, not to incur the ill-will of many persons, and we should not be sorry to see the struggle between the department and the cheap builders, which has recently taken place, even more frequently repeated. If they have raised up bitter and powerful enemies against its head, that is all the more reason why insurance officers, architects, and friends of good building generally should keep themselves informed of the progress of affairs, and, if they find themselves in danger of losing the coöperation of a valuable official, should exert themselves in his defense. The exertion, even if unsuccessful, would have a salutary effect on the public mind, and would strengthen the hands of future incumbents by its promise of moral support, at least, in the faithful execution of their public trust.

THE manner in which the public is primarily responsible for the mishaps which befall itself is illustrated by the disastrous fire at Locust Grove on August 15, where four persons lost their lives. Fashion constrains people to congregate at certain places during two or three months of the year in such numbers that they can be accommodated only in large and necessarily complicated buildings, which, as they are occupied during only a portion of the year, must be cheaply built in order to return interest on the money invested. Moreover, fashion which creates throngs of people at one place this year may leave it deserted the next, so that from a worldly point of view it is hardly fair to expect that capitalists and the architects and builders they employ will use the more costly methods of fire-proof building which are so generally neglected in the more permanent buildings of our cities. The most that can be hoped is that, as the proprietors of the now dangerous wooden hotels at fashionable resorts grow wealthy, they will replace these wooden hotels by fire-proof buildings. Meanwhile it should be understood that every frequenter of these huge wooden caravansaries does it at his or her distinct peril; and a clause might well be inserted in life insurance policies declaring that even a temporary and accidental sojourn in such a building is a violation of the conditions under which the policy is issued. Had the occupants of Gunther's Pavilion and Hotel been abed and asleep how many of them could have escaped during the fifteen minutes between the beginning of the fire and the total destruction of the building?

CONSIDERABLE interest has been aroused in Boston, a city generally well awake to municipal matters, by a letter of Mr. E. H. Derby to the mayor in regard to the disposal of the city sewage. As is well known, an extensive and thorough work of drainage is now under way, by which the waste of the city proper is to be gathered in a great intercepting sewer and discharged into tide-water at Dorchester Bay. To reach the deep-water outlet the sewer must cross the Neponset River, a navigable stream, by an inverted siphon, and a recent decision of the Harbor Commissioners requires this to be kept at such a depth that the cost will much exceed the anticipated outlay. A pumping station is already building at the head of the siphon, and it is a natural question whether the cost of pumping with that of the siphon and the sewer beyond might not be better expended in irrigating the large sandy tracts in the vicinity than in pouring the city refuse into the harbor, from which, as Mr. Derby says, it will soon have to be dredged again at great cost. With the head of thirty-seven feet given by pumping, which will be necessary in any case, the extent of waste land which can be irrigated is unlimited, so that the experiment might, it would seem, be tried under exceptionally favorable circumstances.

THE opinion till lately held by engineers that, however it might be with inland towns, sea-board cities did best to empty their drainage into tidal waters has recently been much modified by the unfavorable experience of London, which, after carrying its sewage twenty miles to obtain an unobstructed outfall, finds that it cannot be got rid of; that a vast "sewage section" merely moves to and fro in the river, depositing filthy silt with a rapidity which has become alarming. That a similar result would be probable in Boston is indicated by the experiments of the commissioners with floats set adrift at the proposed outfall, which moved back and forth for days, most of them being ultimately deposited on the flats which form a large portion of the shore. Independently of the silting up of the harbor, the prospect of the pollution of the water and the inundation of the flats with filth is sufficiently unpleasant to make us consider seriously whether, even at increased expense, the restoration of organic refuse to the land is not the best course in all cases, as it is

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proved to be with inland towns. The brave determination of the English to have their rivers clean at any cost has led them into endless experiments, the results of which will guide us in carrying out such an undertaking with a fair prospect of success. The proper plan would undoubtedly be to combine the "intermittent downward filtration" system, applied to the higher portion of the land, by which a small area is made to purify a vast quantity of sewage, itself being greatly enriched thereby, with a system of direct surface irrigation for the low lands, which would serve as a safety valve for storm-waters, and form a sufficiently fertilizing application for certain crops. That the plan is feasible is beyond a doubt; that it would be immediately profitable is unlikely, although it would certainly prove so ultimately; but it is far more satisfying to the imagination, at least, than the other mode of disposal. On the one hand we contemplate the image which Victor Hugo draws: "These fetid streams of subterranean slime which the pavement hides from you, do you know what all this is? It is the flowery meadow, the green grass; it is marjoram and thyme and sage, the satisfied low of huge oxen at evening, the perfumed hay, the golden corn, bread on your table, warm blood in your veins, health, happiness, and life;" and on the other the frightful picture of the wreck of the "Princess Alice" in the Thames, where hardly one of the wretched victims was able to swim to shore, for the reason, it was supposed, that the poisonous sewage in the water took away their strength, and they died helpless.

When, three or four years ago, the first portion of the Museum of Fine Arts in Boston was finished, it seemed only too probable that the building had been planned on so large a scale that generations must pass away before the need for the whole building could be felt. Two years, however, brought such an increase of treasure that it was necessary to build the second section, which has been finished only some three or four months, and yet very little vacant space is to be found within the building. One of the latest additions to its collections has been made by the transfer to the Museum of the architectural models and casts belonging to the architectural school attached to the Massachusetts Institute of Technology, — a transfer which was arranged when the scheme for establishing a museum of fine arts was first considered. This collection now occupies a large room in the northeast corner of the building, where it is admirably lighted, and, though far from filling the space allotted to it, makes a creditable display. It is by no means a complete collection, even of the casts that are ordinarily found in architectural museums. It gives the impression that its specimens have been gathered together not on any fixed scheme, but rather in accordance with the whim of the collector; for this reason, although it is perhaps no less valuable for the purposes of architectural study, it is certainly more individual. The place of honor is to be occupied by a full-size cast of the Porch of the Caryatides of the Temple of Minerva Polias at Athens, in humble imitation of the full-size casts at the South Kensington Museum, at the Crystal Palace, and at the Ecole des Beaux-Arts. We trust, now that this collection is placed where it can do more public good than before, that its growth may be persistently fostered, not only by the trustees of the Museum and the corporation of the Institute of Technology, but by the profession at large. Many architects who have travelled or studied abroad have, we fancy, brought home more or less architectural casts, which in the lapse of years have outlived their value in their owner's eyes, and have long since been relegated to the tops of book-cases and cupboards, where their begrimed and dust-incrusted surfaces add nothing to the attractiveness of the office. Should the best of such, to the individual, useless lumber be contributed to the public architectural collections that are now forming in New York, Boston, Champaign, Ithaca, and elsewhere, they would be gratefully received by the trustees of the different institutions, who would probably be glad to give them house-room, and the casts would thus be placed where they would do the most good.

Meanwhile, the rooms at the Institute of Technology have been left somewhat bare, and it is proposed, we believe, to replace the casts by a collection of more strictly practical value, that is, by specimens of building materials, woods, stones, irons, and bricks in their natural and manufactured states; by working models of the various sanitary appliances that are invented daily, water-closets, valves, basins, ventilators, etc.; by models of building appliances, and fixtures, scaffolds, elevators, roofing materials, and the innumerable contrivances that go to make up a modern building. We imagine that there will be small difficulty in procuring sufficient material to fill the rooms, for inventors and manufacturers are quick to seize every opportunity to advertise their wares, and the matter probably will resolve itself into a question of elimination and selection. There is need of such a collection in every city, and there is small room to question but that students could derive from it a great benefit. But there is another need which is felt by the profession at large, — one which the Institute of Technology and other similar institutions could do much to remove if, in addition to establishing museums of building appliances, they would attach to them properly equipped laboratories, where the students could conduct researches into the qualities and characteristics of the materials with which they are to deal hereafter, and make, under the supervision of their instructors, an infinity of tests and experiments, which, simple and inexpensive in themselves, would, when properly recorded and attested, be of incalculable value. We do not mean to suggest that tests of the strength of gross materials should be attempted; these must be left for the Government to undertake. The class of experiments that could be made will suggest itself to each reader; it would be an ever-enlarging one, and individuals would always be found ready to suggest possible methods of solving new questions which they have neither time nor opportunities to put to the test themselves. In this way records could be obtained, and published, of the action of every valve, water-closet, fireplace, furnace, ventilator, paint, cement, or other article, under every variety of circumstance that would be encountered in practice.

As the world goes, men, while they would not, perhaps, be surprised to find amongst artist-architects visionaries who could hope for success only in building castles in Spain, would expect to find amongst engineers only clear-headed, practical men. But now and then schemes are put forward by engineers which are so seemingly wild and impracticable that they resemble more the fantastic imaginings of the professional romancer than the suggestions of men whose ideas are supposed to be conformed to the rigid laws of mathematics and mechanics. So much of romance seems nowadays to attach itself to the profession that the father of the future may well stand in dread of his too imaginative son running away from home to become an engineer. The idea of connecting two great oceans by any of the ordinary methods of modern engineering seems to be distasteful to some of the more original minds in the profession; for besides suggesting the various common-place means by which a canal proper can be built, plans have been brought forward, with more or less gravity, for varying forms of marine railways, and even for floating ships across suspended from balloons. Indeed, after the schemes of Mr. Toellner, of Moline, Illinois, and of Mr. Griffin, of Brooklyn, have been announced, it only remains for some one to propose to train water-spouts so that they will take up a vessel from the Atlantic and whisk it into the Pacific without damage or loss of time.

Mr. Griffin proposes to build an iron or steel canal which shall have a mean level of one hundred feet above the sea, since by following the line of the Panama railroad the other side can be reached at this level, only one cutting one hundred and sixty-four feet deep being necessary. To and from this aerial aqueduct vessels of all sizes are to be hoisted and lowered. Mr. Toellner, who has elaborated his scheme to a greater degree, proposes to build a stone trough, more or less V-shaped, lined with steel plates, between which and the stone-work layers of rubber are to be placed. The trough is to be large enough to receive a species of movable dry-dock provided with a multitude of steel rollers, and large enough to receive vessels of any size. The trough at each end is to descend into the sea, so that the dry-dock may be sunk in sections just under the vessel, which is to be supported within it largely by means of air-bags inflated by means of steam-engines. The trough is to be of such a grade that powerful locomotives can easily tow dock and vessel, the grade being essentially that of the Panama railroad. It has been left, however, for a French engineer, M. Gamon, to suggest and make calculations for the most gigantic and visionary scheme of the age. M. Gamon, in brief, proposes to connect the island of Newfoundland with Ireland by means of an embankment, which would contain some twelve thousand cubic miles of material, this material being obtained by excavating the whole island to a depth of one third of a mile.

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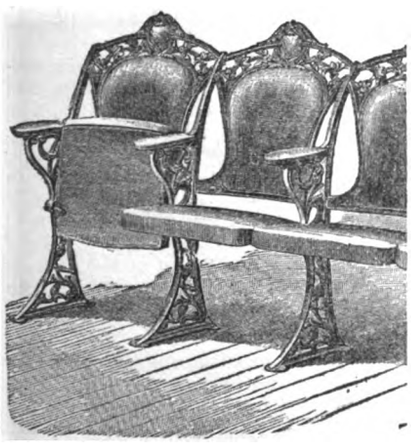
WHETHER M. de Lesseps will ever succeed or not in building the inter-oceanic canal, a fact which seems to be more than ever open to doubt, because of the ill-success he meets in persuading capitalists to take up his shares, the discussion of the question, and the agitation which has arisen because of the uncertainty as to what position the Government may adopt toward M. de Lesseps and his scheme, have led the friends of that other undertaking in which Frenchmen and Americans are interested, the erection of the Statue of Liberty on Bedloe's Island, to regard with disquietude the report that Bedloe's Island has been transferred by the War Department to the Treasury Department as a site for a marine hospital. This transfer, which would be a serious mishap to a creditable enterprise which has received none too much encouragement in this country, it is foolishly suggested, was made as a visible sign of the displeasure which the Government is supposed to feel towards the French inter-oceanic canal scheme. The French Society in New York had hoped to raise a large part of the money needed to build the pedestal for the statue, which is to be America's contribution, by the sale of French lottery tickets, but there seems to be a State law which will prevent the realization of this hope. It is not improbable that the hand and head, which were exhibited at Philadelphia and Paris respectively, are all that will ever be seen of the statue, unless the opening of a world's fair in New York in 1883 may create a renewed interest in M. Bartholdi's enterprise.

AMERICAN DRAMATIC THEATRES. V.

OF the arrangement of aisles in theatres it is perhaps enough to say that they should be without steps (except in galleries, or in the Greek form, where they are unavoidable) and without steep inclines, or sudden changes of incline. They should be well distributed and proportioned in width to the number intended to use them, and should widen toward the exits. A central aisle in the stalls should be avoided, it being objectionable to the actor, who prefers to have in his direct and central front a group of interested faces, and not a blank open way. The disturbance incident to aisles is also better kept away from the centre of the house. Of course no movable seats, or obstructions of any kind, should be allowed in any passages; but that is a matter pertaining to the management. The present styles of tilting seats have a marked effect on the arrangement of a theatre; when not in use they occupy so little room that every row becomes a passage way; and, at the same time, they serve to check any sudden rush, and are not very easy to climb over or stand upon. Some of the patterns are extremely comfortable in use and effective in appearance. The cut shows one of the best of these, originally made for Booth's Theatre, in New York, by the Messrs. Jackson, and used by the writer in the Providence Opera House.



In arranging seats for the proper view of the stage, it is not only necessary that they should be stepped high enough, one above the other, but they should be set as nearly as practicable with the backs at right angles to the line of sight; so that the spectator will not be obliged to keep the head turned to one side. Even when the seat steps are moderately high, the modern bonnets and hats, and the marked variations of height of different persons, make it desirable where practicable to place each seat on a line that would pass between the two in advance; so that one will not be forced to look over the head of the person next in front, but will have the advantage of the rise of two steps. This disposition was made in the Providence Opera House with the Booth-pattern chair, and the seating gave great satisfaction at the time.

In endeavoring to perfect what may be called machine chairs, they have been, in many cases, made too complicated, and the parts too light and weak; the latter defect being partly the result of the sharp competition in prices. Where the working parts are too much elaborated they are apt, under the rough usage of a theatre, to be broken, or so injured as to work with too much noise. They cannot be oiled on account of the danger to clothing, and it is very important that there should be no sharp or rough places on which dresses may be caught. Seats cannot be made altogether easy for persons of exceptional size, but too much care cannot be taken to make them as comfortable as possible to the average occupant.

On the subject of acoustics it is not necessary to treat at great length. No rules have yet been determined that will prove safe guides in all cases; although certain general principles have been established which may, if followed, guard against absolute failure, even though not insuring perfect success. Fortunately the ordinary form of a theatre has been proved by experience to be well adapted to hearing. In order to be certain of success in this respect it is only necessary to provide sufficient reflecting surfaces of wood, or other moderately resonant material; to avoid too great depth under galleries, and large open lobbies back of the different circles; also to avoid too great height or depth to the hall, and all excessive or extraordinary features of proportion or dimensions. Heavy draperies are bad in this, as in all places where clear, distinct tone is important; although a moderate quantity of upholstering for proscenium boxes has not been found objectionable. In large theatres the currents of air for ventilation should travel in the direction it is desired the sound should take. In the smaller houses, that we have chiefly under consideration, this is not essential. It is a noticeable fact that the old theatres in this country that have the best reputation for good acoustic qualities, are, almost without exception, lined or sheathed with pine boards, covered with canvas, glued on.

The ornamentation, both in relief and color of the hall, does not differ so essentially from similar decoration in other buildings as to require extended treatment here. It need only be noted that fine work has little value, and that great breadth of handling, with warmth and strength of color, with liberal but judicious use of gold-leaf on raised and rounded surfaces, are means, which, if skilfully employed, are likely to lead to success.

Red is a fine theatre color, and for its preference as a leading element in the treatment, many good reasons may be given. It is a good foil for most of the color effects exhibited on the stage. It has, in proper combination with gold and offset and strengthened by neutral backgrounds, a richness, warmth, and cheerfulness of effect eminently suited to enhance the attractions of places of amusement. It is a fine gas-light color, and wears well in the heat, smoke, and dust to which it is subjected, necessarily or otherwise. The Oriental splendor of the tints of the nasturtium would furnish fine motives for such a scheme of color. If the strong colors and neutrals are well balanced there is no fear of an injurious effect on good scenery; for the bad — let it take care of itself. Red adds a glow to the cheek of beauty, and thus counteracts the sallow effect of the yellow gas-light. All theatre tints must, of course, be studied by the light of gas, and different portions with special regard to the proximity of local lights.

The bulk of all decoration should be concentrated on the proscenium, the frame of the stage picture, and always before the eye. A good proscenium goes far towards making a handsome theatre. Second and third in importance are the gallery fronts and dome. The treatment of the wall surface may be simpler in character, and serve effectively as a background for the richer parts, and for faces and costumes. The upholstery of the seats must be taken into account in the scheme of decoration; for when the house is but partially filled they constitute a body of color that must not be disregarded. It is difficult to obtain a good idea of a theatre from a single point of view. The best position for the purpose is on the stage; and the result on the actor of this view is an important consideration. Any one of the profession would note at once the difference between a bright and cheerful prospect and one of cold and depressing architectural formality; and his acting would be stimulated or chilled accordingly.

With all the varying opinions concerning illumination it is doubtful if much progress can be made so long as we are restricted to that dirty, explosive, poisonous material — gas. The introduction of the electric, or any other *safe* means of lighting, will reduce all fire-risks in theatres to a minimum. Some improvement has already been effected by the prospective rivalry of the new agent; and gas companies that have long been furnishing the worst product at the highest rate, have suddenly found it expedient to give a much better illuminator at less cost. So long as gas is used the arrangement of one grand central ceiling light, or group of lights, in the dome, and smaller ones to show the local gold and color on balconies, with supplementary brackets on walls and under galleries, is perhaps as good a general disposition as any. All attempts to use indirect lights, or those concealed under glass, have proved unsatisfactory.

The gas-lights of entrances should be supplied independently of hall and stage; and the "cut off" should be under control from the front of the building only. All general supplies should be provided with "bye-passes," so that by no chance can any considerable number of burners be turned out entirely. In all parts of hall and entrances a sufficiency of oil lamps, protected by glass, should be kept burning during performances, to give a reasonable amount of light in case the gas be accidentally extinguished, in order to prevent any panic being caused by such an occurrence. There is no more serious addition to a panic than the sudden putting out of the lights; and, by an association of ideas perfectly natural under some circumstances, the same cause acting on an assemblage of people, generally strangers to each other and to the building in which they are gathered, may initiate, without sufficient reason, the very madness it would at other times increase. The expense of the lamps, or some similar safe device, is small compared to the added security it insures; and should with other matters of the same nature be enforced by law. J. A. F.

THE FRENCH EXHIBITION BUILDINGS. — Only the Pavilion of the City of Paris and the Chinese Pavilion are to remain on the Champ de Mars.

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POWELL'S FOUNDATIONS.[1]

Messrs. Bicknell & Co., and their successors, Messrs. Bicknell & Comstock, have, on the whole, laid the building world under considerable obligation by their enterprise and industry in the publication of technical books. One thing is, however, to be desired of them, that is, a more intelligent selection of the works they are to publish, a selection which would be best made by a well-trained and skilful architect or engineer, who could save them and their readers from being imposed upon by mangled excerpts cut from the works of familiar English writers and put forth as original matter, and by scientific information which would excite the laughter of a twelve-year old school-girl.

The book before us belongs, so far as Mr. Powell's work is concerned, to the worst class; the small treatise by Mr. Baumann, which is appended, is the only part which is of any value whatever, that is not already to be found in other books, much more clearly expressed, and in more condensed form. After an introduction and some pages of text, taken almost word for word from Dobson's "Foundations and Concrete Works," in Lockwood's (Weale's) little series, we have some "practical" directions and definitions such as the following: "A sheet pile is of half timbers in contact, filling the gaps between gauge piles." It would puzzle a novice to divine what that meant, whether the "timbers" were originally round or square, whether divided transversely or longitudinally, and whether ends, sides, or corners were to be placed in contact, but that is preferable to such totally misleading statements as this: "Timber driven into the earth . . . . may be divided by calling all those that stand on solid foundations, posts, and those that depend on the friction of the earth and its constituents are piles." Or this, "In nearly all calculations that are made for pile-driving, the calculations are based on the soil being homogeneous all the way down." Or this "rule": "To find the set of pile at last blow — given: weight of ram, height the ram has to fall in inches, and the safe load the pile is required to hold in cwts. (of 128 lbs.) *Rule.* Multiply the weight of the ram by the height it falls, and divide the product by eight times the safe load which the pile is to carry."

Let us apply this valuable formula. The ordinary weight of rams, the author tells us, is 1,200 to 2,000 lbs. Let us take an average specimen to weigh 1,600 lbs. We desire the pile to carry about 5 tons, let us say 100 of these new-fashioned hundred-weights. We will take the fall at 25 feet, or 300 inches. Applying the formula,

$$\frac{1600 \times 300}{8 \times 100} = 600.$$

We are not informed whether the result will be in terms of inches or feet, so we can take our choice whether we prefer to have our pile driven 600 feet or 600 inches at the last blow.

Of course the instructed reader will detect the omission in the statement of the rule, which is intended to be a deduction from Sanders's formula; but those who have nothing better than this book to guide them will do best, as the author suggests, to "accept the judgment of experienced builders," "as it is difficult to find a locality to suit the formula."

After some liberal extracts appropriated from "Trautwine's Engineer's Pocket-Book," and some natural history about the worm called the *Teredo navalis*, which "has a revolving head like an augur," we come to this important advice, "And the foundations should be made so firm that no doubt will arise about their being insecure."

The next chapter is composed of portions of the New York Building Act, with slices of Dobson, and information about chimneys, which we do not quite recognize, but which reminds us strongly of a late series of articles in the *Building News*, interspersed with more "practical suggestions," such as speaking of squaring the angles in laying out the lines of a building, "Some masons have very large wooden squares for the purpose, which are far more preferable than deciding by sight." Of methods which are still "more preferable" than the use of the crippled and sun-warped mason's squares, there is no mention.

After some very incorrect illustrations of bond in brickwork, we have a little scientific instruction on the composition of Rocks, one of them, apparently, being Air, which "contains 23 per cent. of oxygen, the rest being nitrogen and carbonic acid." Another is granite, which consists of feldspar, quartz, and "little packages of mica;" then comes more Dobson and Trautwine, and some singularly useless and costly devices for keeping cellars dry. For instance, we are shown a section of a cellar wall, on the outside of which, somewhat above the cellar bottom, runs a "drain pipe," resting on a sheet of brick and asphalt, the latter carried up some distance on the outside of the cellar wall. "Drain-pipe" means, in ordinary language, a tight, glazed pipe, which, in this situation, would be just as useful as an iron bar, and no more. If he means drain *tile*, they are placed where they would be of the least use in keeping the cellar dry. It should never be forgotten that after the earth about cellar walls is settled, the water that comes into them rises *from below*, by the change in the level of the ground water after rains, and with such a device as this, the water would stand some inches deep over the cellar floor before it could reach the drain pipe or tile at all. It would be infinitely better, as well as cheaper, to dig the trenches eighteen inches to two feet deeper than the cellar bottom, and fill in with dry, loose stone to within six inches of the cellar floor, or, for a heavy building, to lay a line of drain tile under the footings or just outside; but in any case the drain should be at the lowest point of the excavations, and should, in heavy, wet soils, be continued to some outfall.

After several pages more of quotations from the Building Act, we find some miscellaneous information, the value of which may be judged from one instance, where we learn that "1,000 laths will cover 50 square yards," and a few lines below are told that "1,000 laths will cover 666 square feet."

A few references to recent buildings in New York, which are of some slight interest, if true, and some favorable notices of Moen's Asphaltic Cement, "which I have looked into, and can recommend," of J. B. Cornell's area lights, "which are the best," and other inventions of ingenious and, let us hope, liberal gentlemen, close Mr. Powell's portion of the book.

To the young man or the amateur, who would like to learn something about the subject, we should say, buy Dobson's book, and get the Department of Buildings to give you a copy of the Building Act, and read them carefully, and you will know more than you can learn from a dozen books like this.

The educated architect, on the contrary, will find in Mr. Baumann's little treatise a theory and a narration of facts of singular interest. It would be an injustice to the author to quote any part of his work; it is sufficient to say that he finds reason, in yielding soils, to abandon the received modes of construction, and supports his argument by references to well-known buildings in a way which will command the deepest attention.

In brief, Mr. Baumann's theory is that the spreading of foundations in soft soils, by inverted arches or continuous footings is, as generally applied, wrong; and that the true course is to "*resolve the building, upon its ground plan, into isolated parts, and independently apportion to each its proper share of foundation*," and he supports it in a manner which, even through the ridiculous interpolations and improvements for which he is probably indebted to Mr. Powell's "revision," shows the well-instructed, observant, and thoughtful man, devoted to his profession, and willing to share his knowledge with others. There are not too many of this kind anywhere, and they are particularly rare, and particularly precious in this new country. We shall hope to hear often from Mr. Frederick Baumann.

[1] *Foundations and Foundation Walls.* With sixty Illustrations. By Geo. T. Powell, Architect and Civil Engineer. To which is added a Treatise on Foundations, with Practical Illustrations of the Method of Isolated Piers, as followed in Chicago, by Frederick Baumann, Architect. Revised by G. T. Powell. New York: Bicknell & Comstock. 1879.

THE ILLUSTRATIONS.

THE NATIONAL WALLACE MONUMENT, STIRLING, SCOTLAND. MR. J. T. ROCHEAD, ARCHITECT.

This monument, erected in honor of Sir William Wallace, was finished about 1869, and stands upon the summit of the Abbey Craig. The whole structure is of stone, with external walls fifteen feet in thickness at the base, and decreasing to five and six feet at the top. The base is thirty-six feet square, and the total height of the masonry about two hundred and twenty feet above the rock upon which it is placed, the summit of which is something like five or six hundred feet above the plain below. The first floor contains a portion of the apartments of the keeper and a small museum, together with a straight stone staircase leading to that of the octagonal tower, which is placed at the southwest angle of the structure. This latter staircase leads nearly to the top, and from it are made accessible the three large rooms above the first floor. The rooms at present are bare and empty, but it is hoped that they may ultimately be used as museums in which may be deposited such curiosities and relics of Scottish history as circumstances offer. The crown of the tower is about fifty feet high, and covers an open platform from which is to be obtained one of the finest views in Scotland. The entire cost of the building, was about £12,000.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK, N. Y. MESSRS. THORP & PRICE, ARCHITECTS, NEW YORK.

This is one of the designs which were voluntarily submitted in the late competition.

CORRESPONDENCE.

MOORISH ARCHITECTURE IN SPAIN. — THE MOSQUE AT CORDOVA. — THE ALHAMBRA.

Granada.

The wave of architectural activity which spread out from Cairo in the wake of Mohammedan conquests reached at Constantinople a stern, warrior race, a building people by nature, whose instincts, like those of the Romans, tended to the construction of great buildings rather than to the ornamental aspect of architecture. Thus, as I have shown in a previous letter from Constantinople, the grand forms of Byzantine monuments were more congenial to them than those of the more refined and ornamental art of the Arabs; and where the latter asserts itself it is rather in the guise of flowery Persian, designs introduced through Asia Minor. Very different was the result of the Arabian influence on the refined and intellectual people who carried the Empire of Islam westward and across the Straits of Gibraltar, and there developed a purely decorative architecture. The industrious Moors laid in the Middle Ages the foundation of Spain's

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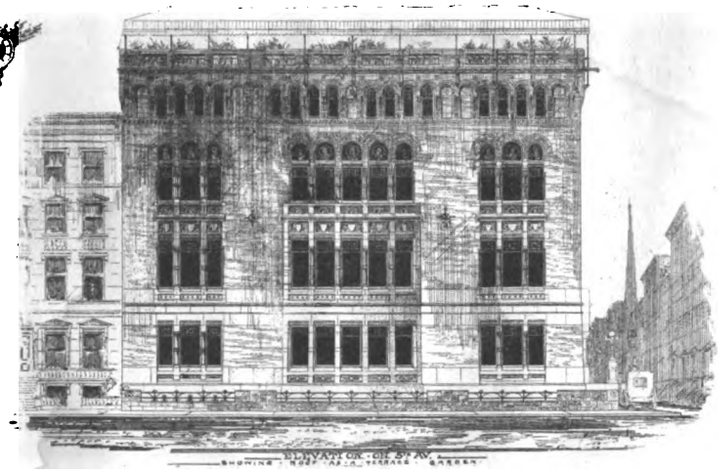
DESIGN FOR

UNION LEAGUE CLUB-HOUSE

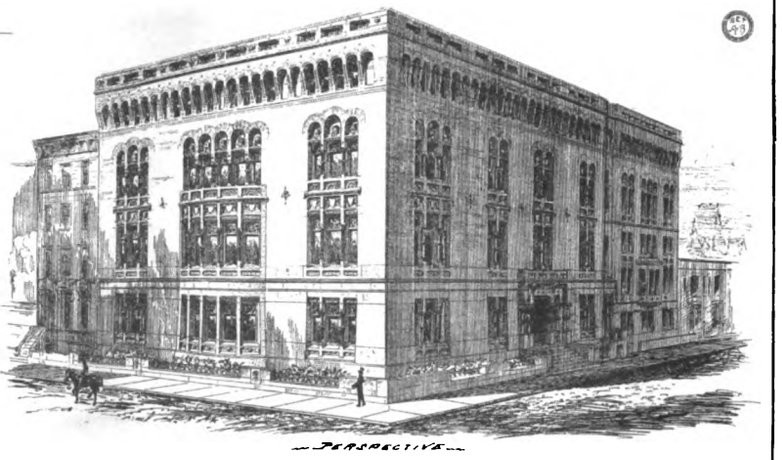
8TH AVE. & 39TH ST.

N-Y



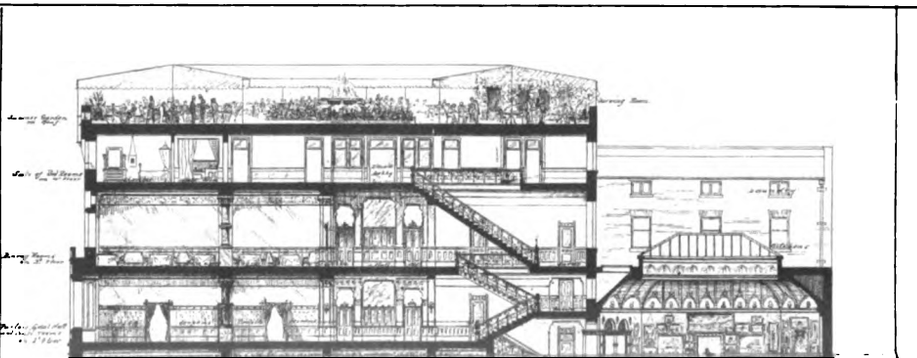
ELEVATION ON 8TH AV.

SHOWING ROOF AS A TERRACE GARDEN



PERSPECTIVE

ELEVATION ON 36TH ST.



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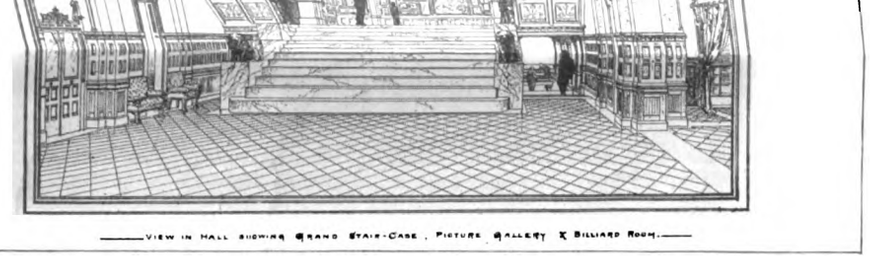
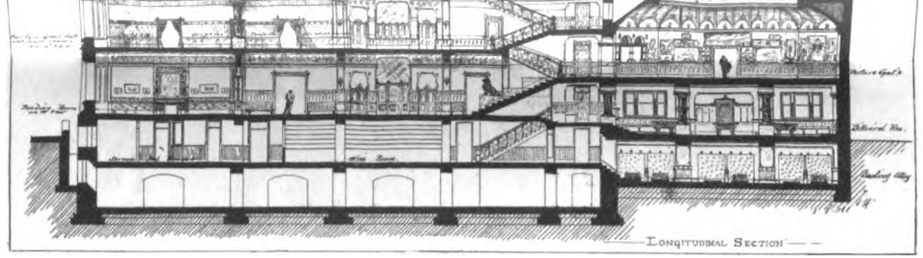
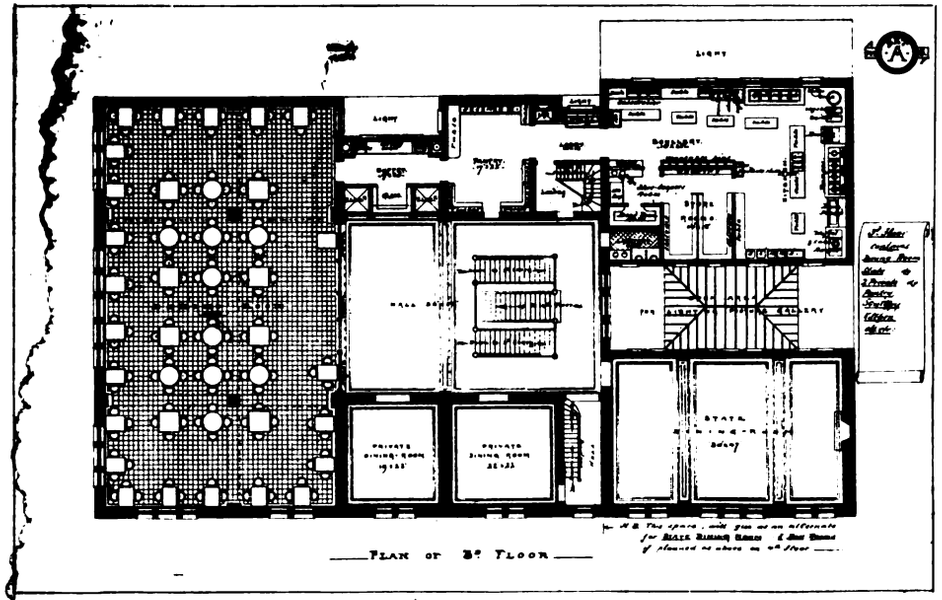


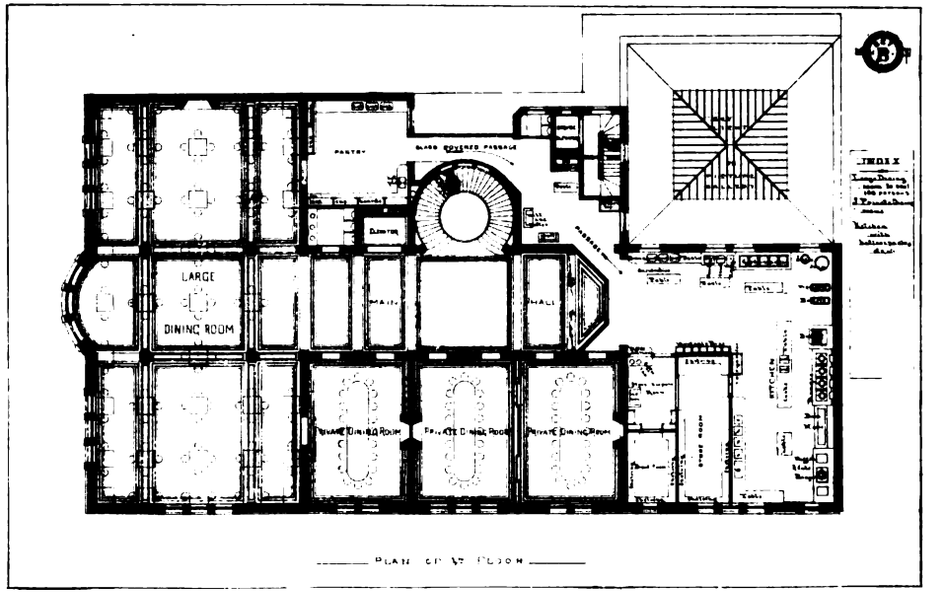
VIEW IN HALL SHOWING GRAND STAIR-CASE, PICTURE GALLERY & BILLIARD ROOM.



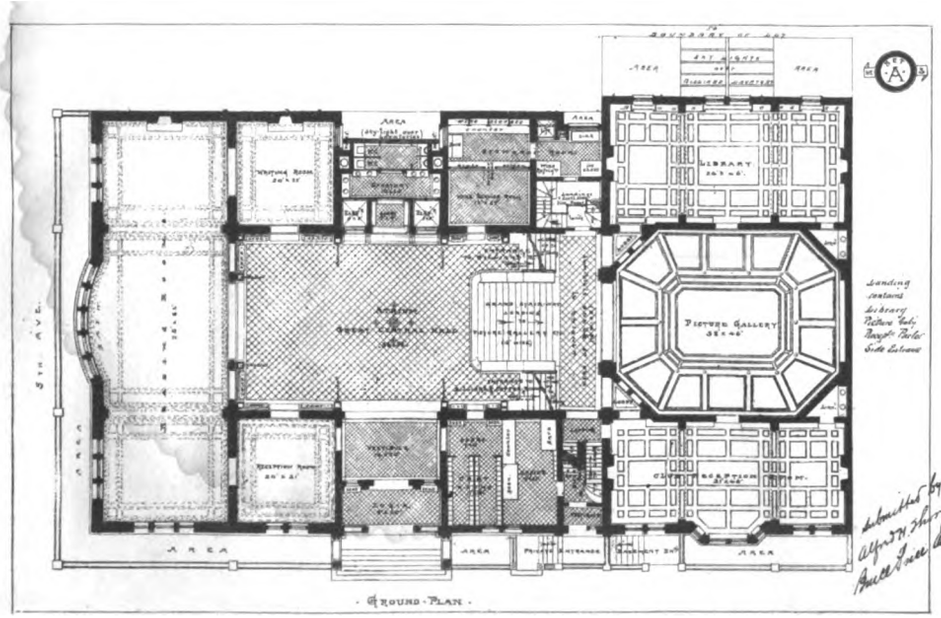
LONGITUDINAL SECTION



PLAN OF 3d FLOOR



PLAN OF 2d FLOOR



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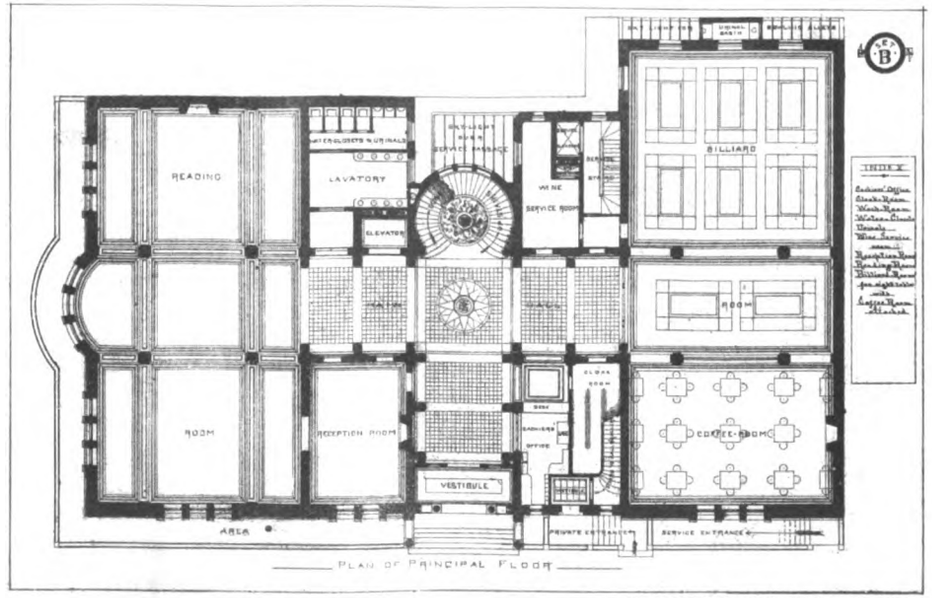

PLAN OF PRINCIPAL FLOOR

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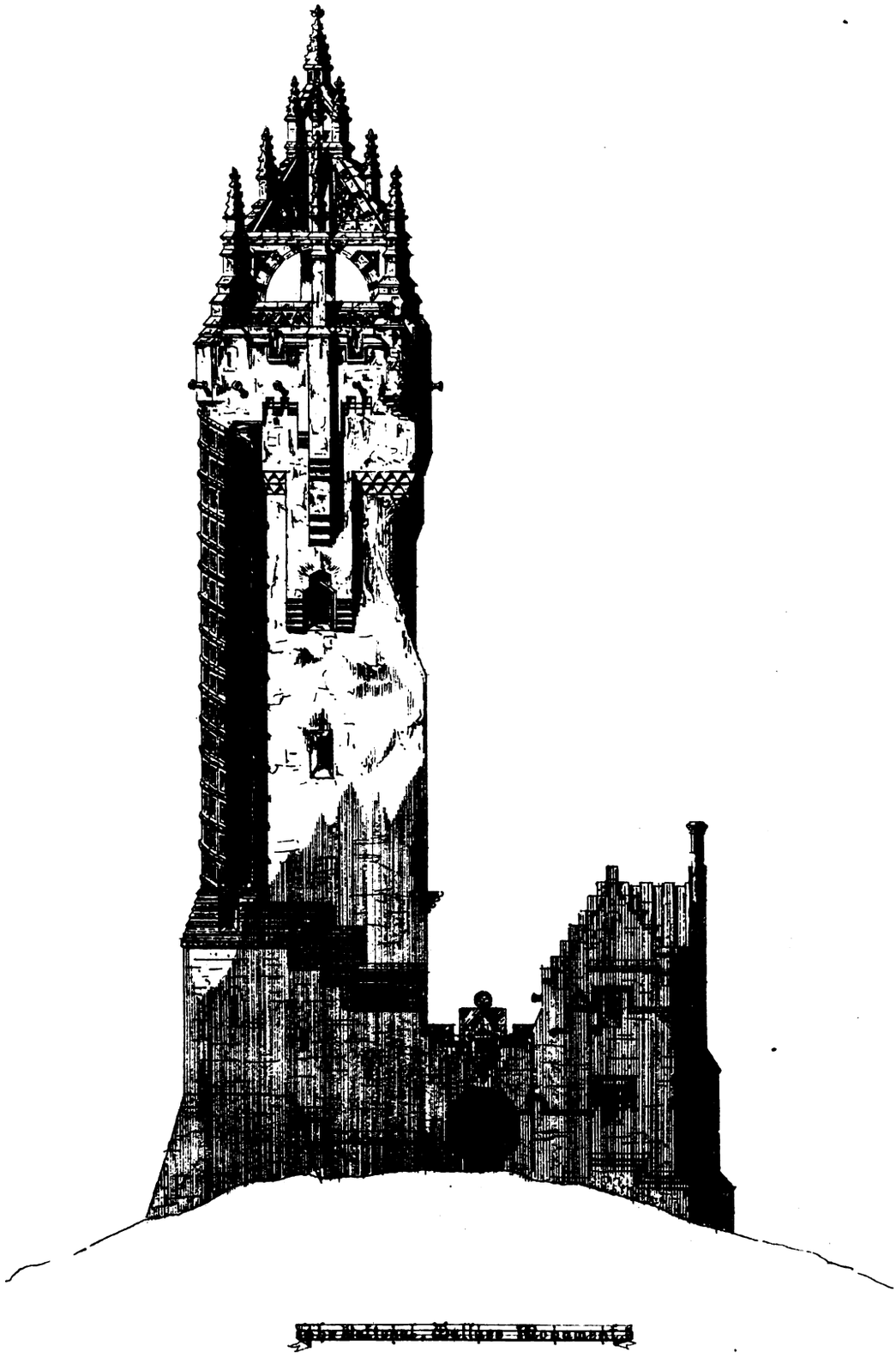

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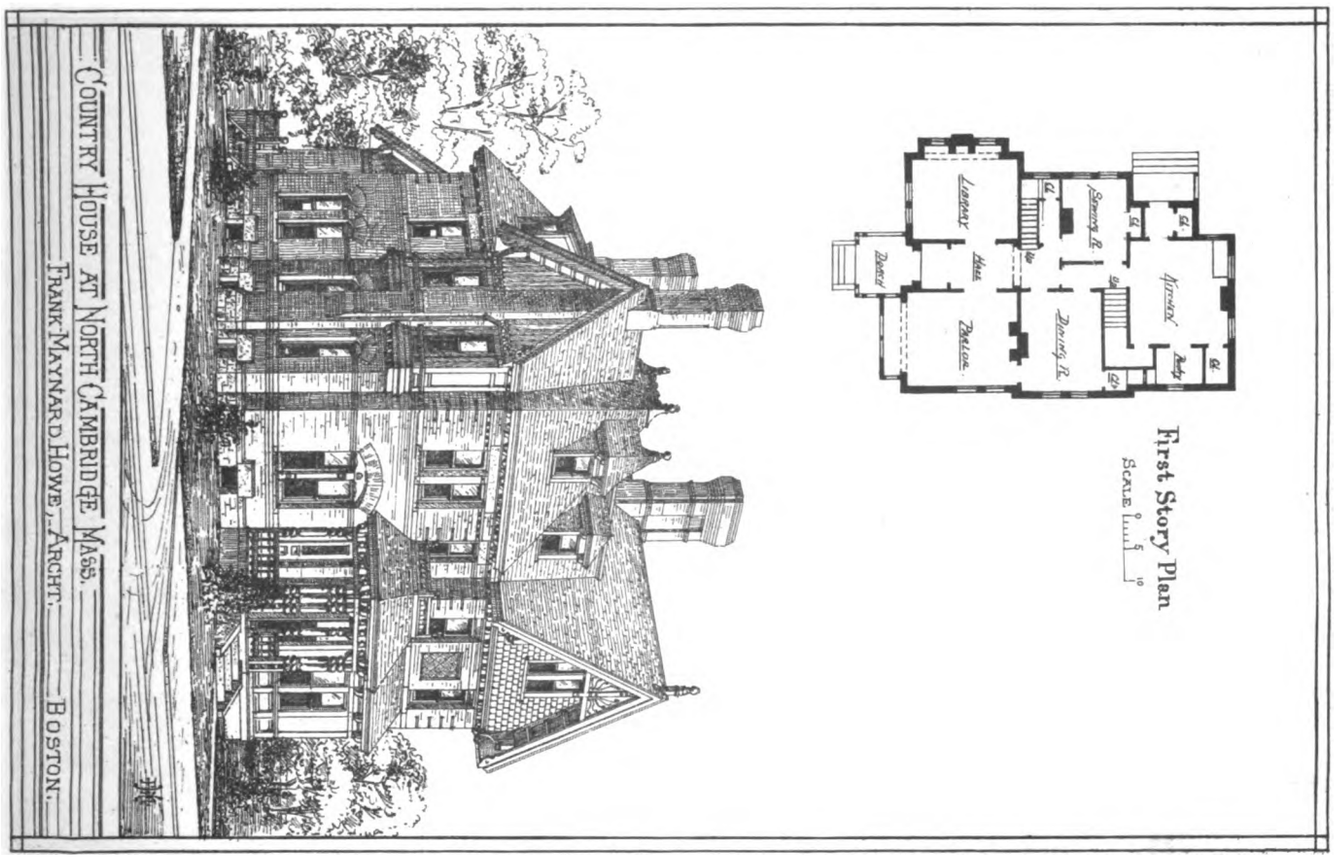
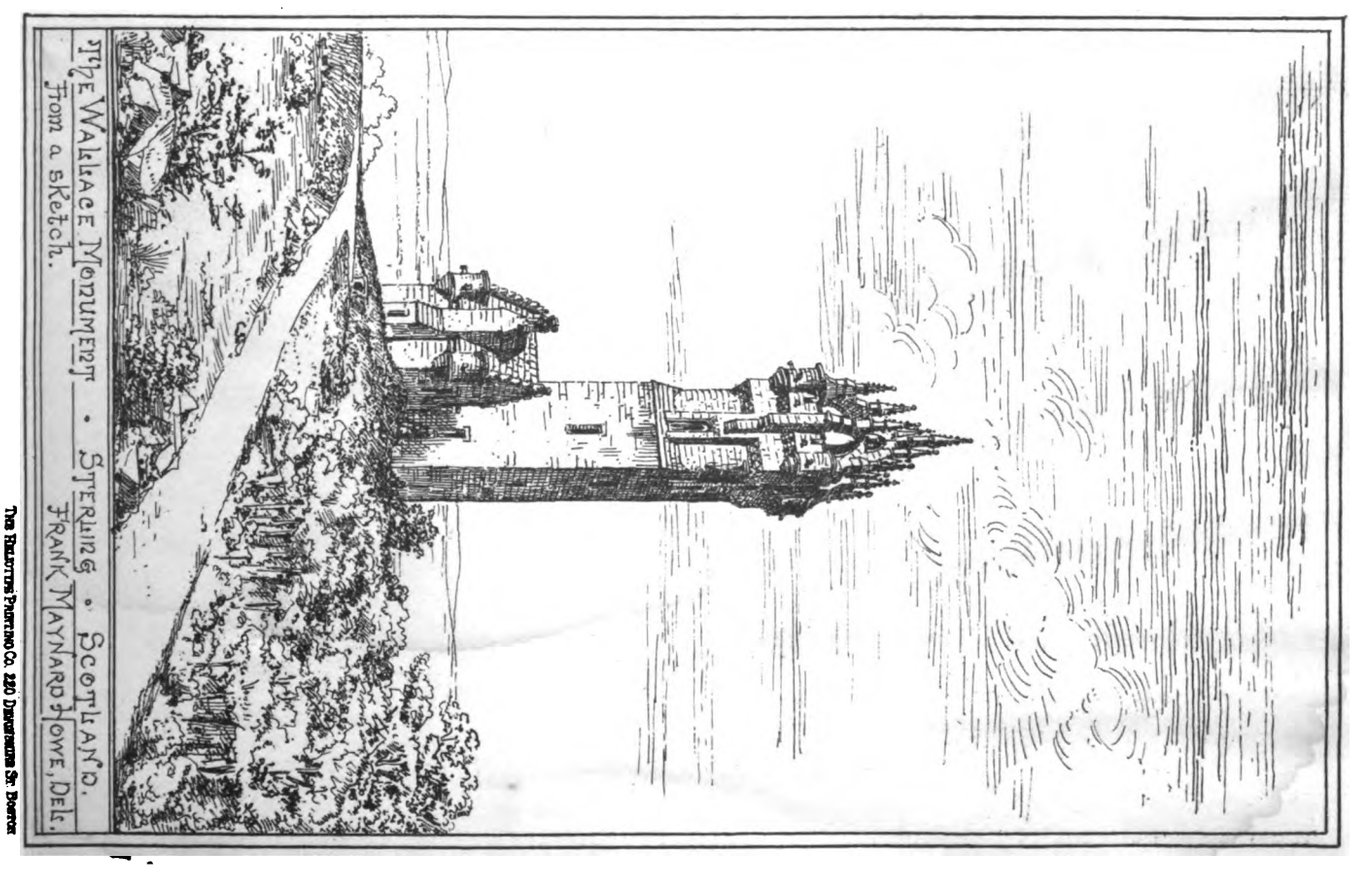


COUNTRY HOUSE AT NORTH CAMBRIDGE, MASS.
FRANK MAYNARD HOWE, ARCHT. BOSTON.



THE WALLACE MONUMENT. STERLING. SCOTLAND.
From a sketch.
FRANK MAYNARD HOWE, DELS.

THE HELIOTYPE PRINTING CO. 120 DEVONSHIRE ST. BOSTON.

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power, and the revocation of the Edict of Nantes, and its consequences, find a parallel in the cruel and disastrous policy which drove, finally, from the country a people who had covered it with their artistic and industrial works. The traveller's admiration is divided between the remains of their exquisite art and their hydraulic science, to whose ingenious system of irrigation the best crops of Spain are still due. Yet the Moors do not appear to have been a true race of builders, and as the purer Arabian influence was withdrawn their characteristic art became principally one of decoration.

Although most of their earlier monuments have been altered or destroyed, one magnificent example is still left in the great Mosque of Cordova, which was built between the years 786 and 796 A. D., a century and a half after the Hegira. Of the Moors who invaded Spain in the beginning of the eighth century, and of the buildings then existing, little is known, though it is certain there were many remains of Roman work scattered over the land, which so materially influenced the invaders, that they subsituted for the pointed arch, universal in the East, the Roman arch, raising the centre, however, and giving it the horseshoe form. In fact, the true Hispano-Arab work is so influenced by classic traditions that it is rather a form of Byzantine than of Arabian art. It was not until the growing power of the Kings of Castile and Leon forced the Moors, in the latter part of the eleventh century, to call in their co-religionists from Morocco, that the Arab influence gained the ascendant; this fresh infusion of African blood showed itself at once in a new style, whose tropical wealth of ornament reached, in the fourteenth century, a full development in the Alhambra Palace at Granada.

Emerging from one of the winding, narrow streets of Cordova, which, as in all Moorish towns, was purposely so built to shut out the fierce southern sun, one comes suddenly upon the great wall surrounding the court of the mosque. This is built, like most walls of that period, of tapia, a mixture of earth, sand, lime, and stone. By the main entrance, under a wide horseshoe arch, rises a tower, which probably resembled the Giralda tower at Seville, but which was clumsily recased at the end of the sixteenth century. Entering a spacious court with arcades on three sides, the view is charming; dense orange trees cast cool shadows in the brilliant sunlight; beyond the wall, with Eastern battlements, rises the dome of the cathedral, which, in the sixteenth century, was barbarously built in the middle of the mosque. Leaving aside for the time this Renaissance excrescence, enter the great central door. The effect is wondrous. On all sides a forest of columns stretches away into the sombre twilight. The mystery of woodland glades is amongst these countless arcades. Shafts of many marbles — jasper, porphyry, and verd-antique — line the darkening vistas; only down the nearest aisle, in the far distance, a pale light falls upon a screen of white interlacing arches. Superposed open arches above the aisle arcades increase the bewildering mystery of the many aisles. Of the twelve hundred monolithic columns which were formerly here (several hundred have disappeared in modern alterations) some were sent from Constantinople, and the remainder were taken from Roman buildings in Africa, Spain, and the south of France. They are arranged in nineteen aisles intersected by thirty-three transverse smaller ones. The eight eastern aisles were added at the end of the tenth century, and though thus two centuries later than the eleven others, there is hardly an appreciable difference in style or work. The arches have keystones of brick alternating with stone, and this is one of the earliest examples of that alternation of colored courses which became in all countries a sure sign of Eastern influence. The double stories of arcades were probably a device to obtain the height which employment of the small Roman columns did not sufficiently give. There was without doubt originally a rich wooden ceiling, such as may still be seen in Cairo, which was afterwards replaced by the brick vaults now in place. Mr. Fergusson is at some pains to explain the original mode of lighting the mosque, and supposes that the upper part of the outer walls was an open arcade; but to one fresh from Cairo, it seems more simple and natural to believe it lighted from above by lanterns of lattice-work, which may still be seen in Egypt in connection with just such wooden ceilings as must formerly have roofed this building. This is the more probable, inasmuch as the light is at present admitted by wells left in the vaulting in the very places which would formerly have had especial need of light.

The simplicity which gives a peculiar grandeur to the main part of the mosque is heightened by the splendid decoration which is concentrated about the Mihrab, or sanctuary towards Mecca. The deep glow of the magnificent mosaics catches the eye from the most distant aisles, and fixes the interest on the sacred niche. This and the two chapels flanking it are enclosed by arcades whose elaborate intersecting and superposed arches are unique. That in front of the Mihrab consists of three cusped arches, whose sides are carried across the central keystones up to the sides of upper arches, supported upon a small order above the large columns. This produces a heavy complication, which would be more curious than beautiful were not the arches relieved by very rich alternate keystones, which gives the desired lightness of effect. The three chapels have each beautiful cupolas resting upon octagons formed by wide arches opening across the corners, and intersecting so as to give alternate penetrations for semicircular windows. These light the superb mosaics with which the vault and wall are covered, and which rival anything to be found at Ravenna or St. Mark's. The Mihrab itself is enclosed in a square frame of golden Kufic inscription on a blue ground; while the horseshoe arch has deep keystones with green Byzantine scroll patterns on a background of red and gold. Within this arch is an exquisite little octagonal niche, with a mural cusped arcade, and covered by one huge stone carved into a ribbed shell. The equally beautiful vaults of the chapels on each side of the Mihrab are whitewashed, but one still retains fine mosaics upon its walls, while similar ones are very likely hidden behind a Renaissance altar which now occupies the other. Excepting the Kufic inscription all the details of these mosaics are Byzantine, and workmen are recorded to have been sent from Constantinople to make them, the connection between the great Eastern capital and Spain being close in those days.

As if expressly to show how the Moors nationalized these Byzantine details, there stands near the Mihrab, among the pillars of the aisles, a curious chapel, whose ornamentation forms a connecting link between this mosque at Cordova and the perfectly developed style of the Alhambra Palace. It is a square room raised about three feet from the floor of the mosque, and is pierced to the north and south with a rich arcade. The ingenious vault is carried upon bold light arches which adjust an octagona upon the square. It is upon the walls that are first seen the profuse and complicated patterns in stucco which became the leading *motif* in the Alhambra decoration. These designs are as yet coarse, and lack the delicate refinement subsequently attained. Here, also, is seen the dado of colored tiles, henceforth a characteristic of Moorish work. This Villa-Viciosa chapel has given rise to discussion as to its use and date, but it is probably of the twelfth century, and was erected as a screen for the sovereign's devotions.

So annoying is it to have the vistas through the aisles of the mosque blocked up by the sixteenth century choir which was built in its centre, that little beyond careless abuse is given to this modern pile; but in spite of its impertinent intrusion it deserves attention as a most elegant piece of Plateresque architecture — which is the Spanish term (silversmith's work) for their development of the François I. and Cinque-cento style — an architecture which received such refined execution at the hands of the clever Spaniards of the sixteenth century, that it deserves a special notice. Passing out, then, from the twilight aisles of the mosque into the sunny court, fragrant with orange trees, and enlivened by the picturesque groups always gathered about the fountain, the violent contrast produces one of those powerful sensations which constantly electrify the artist in Spain.

There is comparatively little to interest the artist in Cordova except the Cathedral-Mosque, and so, with the key-note struck by the Villa-Viciosa yet fresh in mind, let us go on to Granada, and there examine the elaborate style which was developed from it in the fourteenth century. Traversing the snug little town of Granada, a broad carriage-way leads up the hill to the Palace of the Alhambra. Though steep, the way is far from tiresome, shaded as it is by magnificent elms, and cool with the waters of many fountains tinkling down the steep banks. However eager to see the far-famed architectural beauties of the palace interior, it is impossible not to pause a moment on one of the lofty terraces which surround it to let the eye range over the lovely view. Surrounding the steep, outlying hill on which we are standing, a wide fertile plain stretches far away to the hills on one side, while on the other the horizontal lines are gathered up into a grand sweep rising to the shoulder of a magnificent dome of snow, and this so near that the breeze from the snow-fields comes up to us fragrant with the flowers of the plain. The house-roofs and white walls of Granada are at your feet in the foreground. Passing now under the massive Moorish gate-tower, with its noble, pointed horseshoe arch, we are upon a large plateau surrounded with terraced walls and huge square towers of tapia. The first impression of this being the main court of a vast fortress is justified by the fact that such was the purpose of the walls and towers which, in the twelfth century, were built around the whole brow of the hill, and to which the famous palace was added a century later. Here, as at Cordova, a Renaissance design, not without decided merit by itself, brutally elbows its way into the elegant courts of a more national architecture, but here this palace of Charles V. remains unfinished as a monument of his folly.

The present entrance to the Alhambra courts is by a small door in a corner by the Charles V. building; but this humble entrance will be forgiven for the delightful surprise of thus coming unexpectedly into the largest of the Moorish courts. It measures 138 by 74 feet and the middle is filled by a long fish-pond, bordered by a square cut hedge. At the further end rises the huge square mass of the Tower of Comares. This is occupied by the celebrated Hall of the Ambassadors, which is preceded by a rich, narrow vestibule. The portico in front of the latter, with its slender marble columns, supports a double screen, so to speak, of elaborate stucco panels, and only the concealed brick arches are solid, the pierced surfaces of the spandrels being several inches apart, which thus allows the light and air to play freely through, and suggests the sentiment of refreshing coolness, the controlling principle in the design of the Alhambra. The long ante-room which divides this portico from the Hall of the Ambassadors is of great interest. A high dado of colored tiles, in small polygonal forms, and thus a kind of mosaic; walls covered with the most intricate and delicate designs in stucco still preserving pale tints of the once brilliant coloring of the walls; a circular wooden ceiling of Artesonado work, which consists of inlays upon alerce

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(white larch, I believe), forming beautiful patterns, are the characteristics I jotted down on my first visit. To avoid detailed descriptions of what books and photographs can offer so much more attractively, I believe my readers will be grateful if I give them simply some of those notes, and thus spare their patience.

Beyond ante-room, Hall of the Ambassadors, a square of thirty-seven feet, with sixty feet to centre of flat polygonal dome, of Artesonado work. Dado of yellow, blue, black, and green tiles; above, wall covered to roof with stucco designs. Embrasures of windows so deep as to form alcoves, from which magnificent views over the city and Vega (plain). Returning to large court, a small door leads to Court of Lions. Brilliant effects of sun and shadow upon delicate arcades surrounding it. The shape of the angular arches, fringed with stalactites, too uncertain, and they look weak and flimsy. Small projecting pavilions at each end, covered with brilliant blue glazed tiles, contrast with rich cream tint of the arcades. Ends of slender rafters delicately carved with shell-ribbed pattern. Scale of the Court much smaller than photographs suggest. From these porticoes open a series of halls. The two largest with unrivalled honeycomb or stalactite vaults; these of stucco only strengthened with reeds, yet nowhere cracked or dilapidated after five centuries. Five thousand pieces said to compose the vault of the Hall of the Two Sisters. Excepting in these fantastic vaults, feeling of surface perfectly preserved, though there is not a scrap of wall left undecorated. This richness not oppressive, from evident ease of the *procedé*, *i. e.*, a preparation of plaster run in panel-moulds, the cheapest and simplest of material for the designs. Alcove windows of this 'Hall of the Two Sisters look down into the Patio (court), or Lindaraja, where Washington Irving spent so much of his time. Luxuriant shrubbery surrounds the fountain. On this lower level, are several other courts and the baths. The two-storied miniature court to the latter has been recently restored, as part of it fell in. The restoration was done by Don Rafael Contreras, who has charge of the entire Alhambra, and bit by bit is preventing the threatened ruin of these long neglected buildings. With rare intelligence he has refrained from making many restorations, — this Court of the Baths being in fact the only part where restoration of color has been attempted. Great care was taken to follow the very distinct remains of color, and the work has been conscientiously done throughout. In spite of this, after a careful examination of the decoration, I believe Contreras has missed a true restoration. Though throughout the various halls distinct colors remain upon the stucco patterns, something more than deepening and renewing these tints is necessary in view of the changes which time may have wrought upon pulverized pigments. Now the Azulejos, or glazed dado tiles, are original, and have certainly not changed, and this supplies a key-note with which any true restoration must harmonize. The present restoration forms a painful discord with these tiles. The latter have strong prevailing yellows, browns, and greens, which are manifestly out of harmony with the cold blues and vermilions found still upon the walls. To restore that harmony those cold blues must be greenish or green. I was confirmed in this theory on noticing a clever painter, who was at work on a picture of the interior of this court — with no thoughts in regard to its restoration, — unconsciously modifying these blues to exactly the bluish-green necessary. Another reason which renders it probable that time has changed the greens to blue is, that green being the favorite Moslem color after the fourteenth century, and much used by the Moors in tiles and stuffs, it is unaccountable that there should be almost no traces of green to be found on these richly colored walls, — the little which is left being a light emerald tint; so that it does not seem far fetched to suppose that the darker greens have changed. A chemist who would analyze these remains of color, and the influences to which they have been exposed, would throw valuable light on this subject. It is noticeable that the prevailing tones both of the dados and remaining colors are the same in all the halls. Every facility is given to artists wishing to work in the Alhambra, which thus forms a marked exception in a land where petty obstructions to extort fees habitually try the patience of the foreigner. Don Rafael Contreras has executed a set of careful chromo-lithographs of his proposed restorations, and they form part of the great government work (unfinished), "Monumentos Architectoricos de España." Owen Jones's work on the Alhambra is accurate for all lineal details, but chromo-lithography was in its infancy in his time, and his colored plates are worthless. His careful copy of the Court of Lions in the Crystal Palace manages to miss the real spirit of the Alhambra. Girault de Prangey's Essai sur l'Architecture des Arabes et des Mores (1841) is the standard work on this style, which later writers have done little more than echo. R.

THE CITY-HALL INVESTIGATION: THE TESTIMONY CONCLUDED.

Chicago, August, 1879.

The examination of witnesses by the Building Committee of the Common Council has occupied another week, and, as I write, is drawing to a close. The last member of the expert committee examined was L. B. Dixon, architect. He reiterated the statements of other members. With regard to the hollow piers, he asserted that they should be filled with concrete, or even sand, to make them settle with the other work. He thought the small piers should be rebuilt with bond-stones, as they were not strong enough. But when questioned as to his reasons, he said that they should be rebuilt because the bond-stones were shown on the elevations, and were in the stone-cutters contract. In answer to an inquiry as to what calculations of strength he had made, he admitted that he had made no figures, and did not know the exact weight to be carried.

Further witnesses called by the committee were Peter Britton, superintendent of brickwork up to the time of the suspension of the work last winter; Mr. Jordan, assistant superintendent of the whole building, and head draughtsman under Mr. Cleaveland; Mr. Huber and Mr. Long, assistant draughtsmen; Mr. Reid, contractor for stone-cutting; Mr. Tapper, partner of Mr. Reed; Patrick Fanning, who figured on the stone-work; ex-aldermen Van Osdel and Cook, who were on the Building Committee up to May last; ex-Mayor Monroe Heath, James R. Willett, and G. P. Randall, expert architects, having no connection with the building; Mr. Cleaveland, and Mr. Kirkland, his successor.

Without attemping to give even a summary of this voluminous testimony, I will allude only to the substance of it on the various matters in dispute. Mr. Fanning contradicted the assertion of the experts that there were two sets of plans, and that he could not estimate on the correct ones. Jordan, Huber, and Long all testified that there was but one set, and that everything was explained to the bidders. Jordan gave the explanations.

With regard to the Mayor having overruled the architect, it was shown that he had done nothing but order out some thin stones in the granite water-table, and Jordan testified that there remained only three stones which were not as thick as the contract required. He produced his very complete record, showing the actual dimensions from measurement of every stone that had been delivered on the ground. He had been asked by the experts if there was any higher authority over Mr. Cleaveland, and he had said that the Mayor, by virtue of his position as Commissioner of Public Works, exercised a higher authority. The Mayor, he said, had never ordered materials to be used which Cleaveland had rejected.

As to the general quality of the cut-stone work the testimony differed, some contending that it was not equal to the best private work, and others that it was superior to most public works.

There was a general concurrence in the testimony that the brickwork was not up to contract, while some thought it was a good job, above the average, and sufficiently good for safety. But it was shown that most of the brick used were worth two dollars per thousand less than those called for, and Mr. Cleaveland thought that the brickwork was generally so inferior that the contractor should be charged with the difference in value.

It is pretty hard to tell from the testimony whether the long anchors so frequently referred to were necessary for the work, or whether or not they were used. Some claimed that they were, and others that they were not. They were not in anybody's contract, and Mr. Jordan said that Mr. Cleaveland had them sent to the building.

The history of the small outside pier and bond-stone matter, taken from a great deal of testimony, seems to have been as follows: Two bond-stones for each pier were marked on the drawings of cut-stone work. None were mentioned in the cut-stone specifications. The bricklayers' specifications called for bond-stones throughout the interior. The cut-stone contractors refused to make their stones deep enough for bond-stones when marked. A conference was had by the contractor, the Mayor, Mr. Cleaveland, and Mr. Jordan. It was agreed, by way of compromise, that every other course of the cut-stone in the piers should be deep enough to tie or bond the brickwork to the stone-work, from eight to ten inches, and that the bricklayer should not be called on to furnish bond-stones. In his case the extra thickness of outer stone-work must have equalled the spaces which he had to fill with brick, when bond-stones might have been used. In addition to this short stone bond, anchors were used in each course. The piers were built thus.

All the witnesses, except the expert committee and Mr. Kirkland, thought the piers were well built and strong enough. Only three of them produced any figures to demonstrate this, and these were Mr. Cleaveland and Mr. Willett and Mr. Randall, the expert architects called in by the Building Committee. Mr. Cleaveland demonstrated by figures that the piers as built had a large factor of safety. Mr. Willett, on examination, found that the larger portion of the piers consisted of Bedford stone. This stone had been tested by Gen. Q. C. Gillmore, who gave it a crushing strength of 11,750 lbs. to the inch. Mr. Willett found that a crushing weight on the stone alone would have to be 840 tons to the square foot. Taking a factor of safety of $\frac{1}{8}$ (which, by the way, happens to be Professor Rankine's factor for a *live load* on masonry), the safe load would be 105 tons to the square foot, or 403 tons to the whole of the stone-work, to which may be added the safe load on the brick backing of 52 tons. I cannot find any testimony to show what weight the piers will have to carry, but Mr. Cleaveland assured me that it is 140 tons.

The opinion of the experts that the last course of iron beams and columns set on the building should be painted, does not seem to be questioned. This, being, as your correspondent was assured by a member of the Building Committee, the only thing which the expert committee had recommended with any positiveness, will doubtless be carried out to the letter, and the rest of the work allowed to proceed without interruption. Fortunately, there has been no interruption thus far, for a majority of the Common Council could not be induced to stop the work.

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The charges, in the main, have been practically an attack on ex-Mayor Heath and Mr. Cleaveland, both of whom have now retired to private life; and as they have both felt that a stigma had been cast upon them, they may now at least have the satisfaction of seeing all the facts brought to light, so that the public may see that they have performed their duty to the best of their abilities.

The Building Committee will report to the Council on August 18.

Since the above was written I have received the report of the testimony of Mr. Kirkland and Mr. Randall. Mr. Kirkland thought the small piers were not strong enough to carry the weight they would be called on to bear. He was of the opinion that the brickwork was the special bearing factor of the piers, and that the stonework was simply a matter of ornamentation. He thought a stone overlapping a few inches would have no bearing weight whatever. He placed no reliance whatever on the bearing capacity of the stonework. He took the whole thing, brick and stone, as a brick pier simply, and they would not carry safely over 40 tons. He considered that the large piers would be better solid than hollow.

Mr. Randall said that a compound wall was not so strong as one of either brick or stone. He thought, however, that the piers were abundantly strong to carry the weight of the building. He considered that the majority of the weight would be carried by the stone wall. He believed the walls were stronger now than they would be with the long bond-stones, it being admitted that the brickwork would settle between the bond-stones. He made the bearing capacity of the small piers a little less than Mr. Willett did. He considered it judicious to build the large piers hollow, as thereby the brickwork was allowed to dry more uniformly, and sufficient allowance had been made for safety.

THE BOSTON SOCIETY OF ARCHITECTS' PRIZES.

BOSTON, July 1, 1879.

PROF. WILLIAM R. WARE, Institute of Technology, Boston.

Dear Sir, — We have carefully gone over the work done by the students in the Department of Architecture during the past year, and have been impressed, as heretofore, by the quantity, variety, and general excellence of their drawings. The prizes given by the Society of Architecture for the best year's work we have agreed to award to Mr. Arnold W. Brunner, of New York, and to Mr. Cass Gilbert, of St. Paul, Minn. We desire also to mention with commendation the work of Mr. Herbert Warren, of Roxbury; Mr. Ernest G. Hartwell, of Waltham; Mr. Thomas O'Grady, of Boston, and Mr. Oscar E. Brandt, of Cincinnati, Ohio.

Mr. Hartwell is this year the only student of the department who graduates after taking the full four years' course of the Institute. His thesis on the Design and Construction of a Public Library, with its accompanying drawings, gives evidence of careful study and of an intelligent appreciation of the requirements of the problem. The committee regret that a larger number of architectural students have not taken the full general course.

EDWARD C. CABOT,
HENRY VAN BRUNT,
CHARLES C. CUMMINGS,
} Committee.

SEMNAR, THE GRECIAN.

WHEN the famous Behram-gur was yet a babe his father, King Yezdegird, sent him for health and security into Arabia. The tyranny of Yezdegird had caused much misery to his subjects, and even his autocratic heart began to fail as one after another of his fair sons perished in early infancy. He feared the approach of a childless old age, of a time when there would be no filial hand to console him, and no stately son to inherit the greatness and the glory of his kingdom. Hence Prince Behram was sent to the land of Yemen, that by a change of place he might happily realize a change of that sad fortune which had consigned his elder brethren to their early graves. Prince Naoman travelled expressly from his own court to that of his suzerain, and received the royal child. On his return to Yemen he faithfully executed his trust, and though young Behram grew from a beautiful babe to a sturdy youth, Naoman was still full of anxiety for his welfare.

"This palace," said he to his son Menzer, "is too hot and scorching for the royal child, and the air of my other palace is too damp. Let us find an abode for him which shall pierce the clouds. There the young eagle may flap his wings and drink in the pure air of the empyrean."

Menzer sought anxiously throughout Yemen for a palace that would serve their purpose, but he sought in vain.

"No such castle exists," was the reply made to his inquiries by one who had travelled much, "and only one man on earth has the skill to construct such a habitation."

"Who is this wonderful architect?"

"Semnar," the Grecian," replied the traveller. "In his hands the granite becomes like wax, and he moulds it into a thousand varying forms of beauty."

"Hast thou seen his works, O traveller?" asked the prince.

"Many gorgeous structures have I seen that were devised by his fertile brain and skilful hand. Many regions acknowledge his genius, many kings have asked for his services."

"Go, then," said the prince, "and by entreaty or command obtain me the help of this architect for the erection of a palace for the childhood of Behram-gur. Bid him give us of his best, and we will reward him royally. He shall have a robe of honor, a steed of state, seven slave maidens, and a hundred bags of gold if he builds that which we desire."

The traveller carried the message to Semnar, the Grecian, and delivered to him the gold and jewels which Menzer had sent as an earnest of his liberality. Semnar determined to undertake the erection of the palace of the childhood of Behram-gur, and received from Naoman and Menzer the statement of their desires. Then he retired to silent and solitary meditation, and remained secluded in his room for seven days, seeing neither the face of heaven nor the face of man. In that gloomy abstraction the power of his talent compelled the vision of the palace as it was to be, with towers that pierced the heavens, and foundations strong and stable as the great globe itself. The work of building began at once. Swarms of slaves dug deep the foundations, and soon the stately pile grew beneath the fostering eye of the architect. Higher and still higher grew towers of grandeur and pinnacles of pride, until at the end of five years of incessant toil the mighty structure was complete. Semnar, the Grecian, gazed with pride upon the work of his hands. Its fame spread through many kingdoms, and thousands came to see it. Poets sang its praises. The towers, they said, were like the houses of the moon; the dome was encompassed by paintings of the planets in their courses; the polished stone glowed like gold, and the cement shone like silver; the rays of the sun were reflected from it with a light as dazzling as that which beams from the eyes of the damsels of Paradise. Its hue changed with the varying hour. In the early morning-tide it glimmered like a faint pale sapphire; when the sun was high in the heavens it wore the dazzling aspect of the topaz, but as the evening shadows fell upon the earth it seemed in its white beauty like the spirit of the divinity brooding over the world. Thus sang the poets, who declared that it eclipsed the fame of the Garden of Eden, and that henceforth Yemen should be known as the Land of Khavarnak.

Semnar, the Grecian, was now to receive his reward. The princes sat upon their thrones in the hall of audience high in the towers. From the windows could be seen rich towns, fair villages, running streams, green forests, spreading meadow land, and every variety of landscape to please the eye and charm the fancy.

Naoman was now known as the Lord of Khavarnak, and the possession of this palace was the proudest jewel in his crown.

"We have desired," said Naoman, "to praise thy skill, O Semnar, in this palace, which will remain to the most distant ages as a monument of thy talent. Great has been thy skill, great thy toil, and great, therefore, must be thy reward. Fame will spread thy reputation to the four quarters of the earth, and history preserve thy name to future ages. Be it mine to reward thee in the present."

Semnar bowed to his princely patrons, and felt the gratification of talent that has won its way and received acknowledgment.

"We promised thee," continued Naoman, "a robe of honor, a steed of state, seven fair slave girls, and a hundred bags of gold. Was not this our covenant with thee?"

"It was, O Naoman," replied Semnar, the Grecian.

"In the court-yard below," said the prince, "there are forty steeds, and each is richly harnessed; and they bear as their burden a thousand bags of gold. Instead of one robe of honor we give thee seven, so that on each day of the week thou shalt be saluted with reverence by all our subjects. Besides these seven we give thee this one."

As he spoke Naoman descended from his throne, and taking the royal robe from his own shoulders he placed it upon that of Semnar, who, astonished at this munificent generosity, could find no words warm enough for his gratitude.

"We promised thee seven slave girls," said Naoman, not heeding his thanks. "We give thee four times that number of blooming maidens, each one worthy to be a houri of Paradise."

He clapped his hands, and a bevy of beautiful damsels entered the hall, and saluted with bashful confusion their new lord.

"O Prince," cried Semnar, "great, indeed, is thy munificence; never yet was artist so greatly rewarded. Many kings have I served, but none gave me so royal a guerdon. Had I foreseen such generosity I would have made the Palace of Khavarnak still more beautiful and worthier of the liberality of its lord."

This boast jarred on Naoman. It was a discord amidst the jubilant music of his pride.

"Is it possible, then," he asked, "to devise a palace more beautiful than this?"

Semnar, the Grecian, answered with the pride of talent, "In Khavarnak there are three colors, but I could rear a palace in which a hundred hues should combine in harmony. Khavarnak has but one dome, but in another seven domes should bulk against the sky. There are a thousand ways in which, were I building another palace, I could eclipse the glories of Khavarnak."

Naoman's brow darkened. His generosity was the offspring of his pride. He wished to give a matchless reward to the architect who had made him master of the wonder of the world. What if some rival monarch should, by the help of Semnar, the Grecian, build a structure of even greater magnificence? The thought was gall and wormwood to the proud heart of Naoman. He clapped his hands again and a eunuch appeared, to whom Naoman gave his whispered orders.

The thousand bags of gold were replaced in the treasury, the horses

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were taken again to the royal stables, the damsels were conducted to the harem of Menzer. Semnar, the Grecian, thrown through the window of the hall of audience, fell, dashed to pieces, into the court-yard below. His death-cry mingled with the voice of the priest, who from the lofty mosque was calling the faithful to their evening devotions.

"Come, my son," said Naoman to Menzer, "the hour of prayer has arrived. Let us thank God that there is one unbeliever less in the world."

As they went to prayers the dogs were lapping the blood flowing from a shapeless mass that a few moments before had been Semnar, the Grecian. — *The British Architect.*

NOTES OF EXPERIENCE AND INEXPERIENCE.

Sliding Doors. — As we have mislaid a correspondent's letter in which certain questions were asked as to the hanging of sliding doors, we can answer only at random. Doors may be hung from the top or may travel on a track let into the floor, but in either case friction rollers, either Hatfield's or Collins's, should be used. We prefer the method of hanging from the top, because the unsightly rod or track let into the floor is avoided, and the carpet can be continued from one room to the other.

34. Stone. — What heating stove, to burn common hard coal, is best to heat a room about 15 × 15, in the clear? I am finishing up a house for an Eastern man, and he thinks some Eastern manufactured stove would be the best. If you or some of your subscribers will give me the information, it will be thankfully received. A Subscriber.

35. Water-Color Paper. — Will some artist kindly recommend a good quality of paper (not too rough) for water-color painting, and state where it can be obtained. R. B

NOTES AND CLIPPINGS.

The Albert Memorial. — The London *Echo* says that a number of scientific gentlemen have been inspecting the Albert Memorial in London, because it was reported to be losing much of its pristine beauty under the trying influences of the London climate. If the fogs and rains had only been content to tone down the high color and glaring brand-newness of the metal-work and the mosaics, few would have been found anxious to interfere; but unfortunately it is the marble, in which has been executed the podium with its magnificent sculptured figures, in high relief, of the noted men of science and art throughout the world, together with the groups representing manufacture, trade, etc., and the larger groups typifying Europe, Asia, Africa, and America, that has been affected. It is said that the somewhat rough washing to which the monument is now and then treated has destroyed the originally fine surface of the marble, and has made it more susceptible to the attacks of the noxious acids and vapors of London, and, as the *Echo* naïvely adds, to the "carbonic acid evolved from the lungs of animals." The result is that the sculptures have the appearance of being executed in chalk rather than in marble. It is now proposed to clean the monument perfectly, and then treat it with the same transparent indurating liquid that was used lately for preserving the surface of Cleopatra's Needle, so-called, from atmospheric attacks. It is to be hoped that if the deterioration is as grave as the report represents, this course will be adopted, or else Mr. Bedborough may be encouraged to bring forward his unappreciated design for a crystal palace which shall enclose the Memorial altogether.

Bridging the English Channel. — M. Venard de Saint Anne, the originator of the project for bridging the English Channel, promises to begin operations without delay. He estimates it will require seven months for experiment, and that 1,000,000 francs will suffice to pay the preliminary expenses. To raise the funds, he has laid the project before the French and Belgian Chambers of Commerce. Eighty-four of these have expressed themselves in favor of the project. He will visit England, shortly, to lay the matter before the English government. To span the deep water he has recourse to the tubular system.

Quiet Enjoyment. — It is amusing to learn that a case has just been tried before the Queen's Bench Division in which the plaintiff claimed that because a water-pipe, introduced into the house in the usual way, had burst and destroyed the plaintiff's property, he being the tenant of the building, the landlord was actionable for damages, in that he had covenanted to give him "quiet enjoyment." As might be expected, the plaintiff did not recover damages, the presiding judge dismissing the case with the remark that it was another added to "that class of cases in which losses happen for which there is no legal redress."

Fireworks at Alost, Belgium. — A few weeks since the authorities of Alost, in Belgium, on the occasion of some civic festival, allowed the town-hall to be illuminated, and a large piece of set-fireworks was attached to the tower and there discharged. As might have been expected, this piece of municipal wisdom was followed by an illumination which was not put down in the programme, for when the fireworks had burned out the tower was found to be in flames. The fire-brigade succeeded, apparently, in extinguishing the fire before serious injury had resulted, but unfortunately at two o'clock in the morning the fire again broke out, and before the firemen could subdue it the tower, which was built in the twelfth century and is said to have been a very fine example of the period, was totally destroyed.

The Government Testing-Machine. — The government testing-machine at the Watertown arsenal was exhibited lately to General Benét, chief of the ordnance department at Washington. A bar of iron, four feet long and five inches in diameter, turned down to 3⅛ inches diameter in centre, was broken by a tension force of about 500,000 pounds. General Benét was much interested in the workings of the machine, and regrets that no appropriation has been obtained to keep it in operation for important tests.

Larch Wood. — Any one who has undertaken to fell a larch tree, even with the help of the sharpest axe, has found that he had to deal with wood of very unusual toughness. How much the wood is used in this country we do not know, but it has such valuable properties that the tree deserves cultivation. It was well known to the Romans, who highly prized it for the sake of its low degree of combustibility. Cæsar, in his Commentaries, speaks of it as *igni impenetrabile lignum*. Mr. J. Wheeler, in a treatise, on the Best Timber for Paving or Building Purposes, speaks of it in high terms, and Professor Koch, of the Berlin University, an eminent botanist, in his Dendrologie, commends its toughness of fibre and its power of resistance to moisture. The qualities of the larch are well known in the European countries where it is indigenous: in Switzerland, where the vine props made of it support the vines through successive generations, it is so highly valued that a piece of larch wood is worth more than a piece of oak wood; while in France it is used for water-pipes, as it resists decay almost equally well whether buried in the ground or exposed to air. The weight of larch per cubic foot is about thirty-two pounds, while oak (English) weighs about fifty pounds; oak will endure a strain, lengthwise of the grain, of three to eight tons per square inch, while larch will endure from two to five tons only; oak has a stiffness represented by one hundred, larch is represented by seventy-nine, yet larch, according to Tredgold, has a strength of one hundred and three, while the strength of oak is represented only by one hundred. Its color is honey yellow, and its grain has a silky lustre not unlike satin wood and is straight and free from large knots. Still, in spite of its strength and durability it shrinks and warps a great deal unless it is seasoned with perfect thoroughness. Brown, in his Forester, calls it "decidedly the toughest and most lasting of all the coniferous trees."

The Inter-Oceanic Canal. — It is said that not only is Nicaragua ready to open negotiations with the United States to bring about the construction of a canal through its territory, but has already undertaken to build one, and already has part of a ship canal ready for business. It only remains to complete the improvements at the Machura rapids and build the locks about the Castillo rapids to make a connection between Lake Nicaragua and the Atlantic. The ground between the lake and the Pacific has been carefully surveyed, the distance being about thirteen miles.

Protecting Iron from Rust. — A new process for protecting iron from rust has been invented by M. Dode. It consists in coating, either by means of a bath or a brush, any objects in cast or wrought iron (freed from the damp they may contain) with a composition of borate of lead, oxide of copper and spirits of turpentine. This application soon dries on the surface of the iron, and the objects are then passed through a furnace, which is heated from 500° to 700° Fahrenheit, according to the thickness of the articles under treatment, so as to bring them to a cherry-red heat when passing through the centre of the furnace. At this point the fusion of the metallic pigment takes place; it enters the pores of the iron, and becomes homogeneously adherent thereto, covering the objects with a dark coating, which is not liable to change under the action of the air, gases, alkaline or other vapors, nor to scale off from the surfaces to which it has been applied. — *Popular Science Monthly.*

Incombustible Wood. — M. M. P. Folbarri claims that he has discovered a method by which wood of any kind can be rendered incombustible. It becomes, as it were, petrified without any alteration in appearance. Intense heat chars the surface, slowly and without flame, but does not penetrate to any extent, and leaves the fibre intact, whereby in case of fire the firemen would have no occasion to fear that the materials on which they tread would give way beneath them, if this operation has been undergone by the wood composing the staircases, floors, etc. The following chemical compound is said to produce the result: Sulphate of zinc, 55 lbs.; American potash, 22 lbs.; American alum, 44 lbs.; oxide of manganese, 22 lbs.; sulphuric acid of 60°, 22 lbs.; water, 55 lbs.; all of the solids are to be poured into an iron boiler containing the water at a temperature of 45° C., or 113° F. As soon as the substances are dissolved the sulphuric acid to be poured in little by little, until all the substances are completely saturated. For the preparation of the wood it should be placed in a suitable apparatus, and arranged in various sizes (according to the purposes for which it is intended) on iron gratings, care being taken that there is a space of about half an inch between every two pieces of wood. The chemical compound is then pumped into the apparatus, and as soon as the vacant spaces are filled up it is boiled for three hours. The wood is then taken out and laid on a wooden grating in the open air, to be rendered solid, after which it is fit for uses of all kinds, as ship-building, house-building, railway-carriages and trucks, fence-posts, wood paving, — in short, for any kind of work where there is any liability to destruction by fire. — *Building News.*

The Hanging Gardens of Babylon. — Mr. Rassam's excavations on the Mujelibi Mound have proved that this was the site of the famous hanging gardens, for in its ruins he found wells, aqueducts, and ponderous masses of stone, all proving that the building had been erected, as the Greek writers say, to imitate mountain scenery. The stone used was a black basalt, which is formed only in the Armenian hills, and the immense masses must have been floated down the river. In a mound to the south of the mass of city ruins, called Jumjuma, Mr. Rassam discovered the remains of a rich hall or palace, with columns composed of enameled bricks and mosaic; the cornices were of painted brick, and the roof of rich Indian black wood. From the position of this palace or banqueting hall it would appear to have been situated on the bank of the river, and was probably the site of the state festivals and banquets. The inscriptions found there prove the edifice to have been erected by Nebuchadnezzar, and probably beautified by his successors. — *The Athenæum.*

Swiss Drawing Instruments. — A practical mode of protecting Swiss drawing instruments from rust is to coat the warm metal with a very thin lacquer of shellac dissolved in alcohol.

Glass Pipes. — Captain John B. Food, of Jeffersonville, Ind., has taken out a patent for making glass water, sewer, or gas pipe. It can be made of any size, having even a diameter of six feet; the thickness of the glass varying from half an inch to an inch and a quarter, according to size.

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THE magnificent energy and public spirit put forth by the State of Pennsylvania and by the city and the citizens of Philadelphia, in organizing and carrying through the Centennial Exhibition seem to have been succeeded by an apathy and indifference which threaten to imperil its permanent results. The Permanent Exhibition, after dragging along for three years in the Main Building, is now summarily brought to an end by the decision of the Park Commissioners to have the building at once removed. Meantime the Memorial Hall, erected by the joint efforts of the State and the city at a cost of a million and a half of dollars, is falling into decay, the roofing and the statues on the roof having been made of galvanized iron and other perishable materials, partly from haste, partly from economy. This building was intended to be a memorial of the great exhibition and of the distinguished part the State and city had taken in it, and it seems to be agreed that the building belongs to the State and should be cared for by it. Twenty thousand dollars are needed to put it in good condition, and a much larger sum will have to be spent if the original scheme of sculptured decoration were adhered to. But the legislature has at successive sessions refused to meet the case, appropriating at last a niggardly sum of five thousand dollars, — hardly enough to repair the broken skylights. The water pours into the building in every part after heavy rain-storms, so that the interior finish is rapidly deteriorating, while the sheet-iron eagles are gradually flying away from the roof, one wing at a time, and the statue of Columbia that crowns the dome has lost its laurel wreath and the hand that held it, and has so settled down through the decay of the base upon which it stands that the backbone of iron that supported it, projects above its head, giving the figure the general aspect of a martyr at the stake.

MEANTIME the building has been granted to the trustees of the Pennsylvania Museum and School of Industrial Art, a private corporation, who have undertaken to carry out the intentions of the city and the State by establishing schools of industrial art and forming such a museum of industrial art as their unrivalled opportunity made possible. Visitors to the exhibition will remember how many of the most interesting objects were marked as having been secured for these collections, mainly chosen, it was understood, under the advice of foreign experts, and at the close of the exhibition they were largely augmented by princely gifts from foreign governments. These unique treasures, worth from a quarter to half a million of dollars, are in daily peril of irreparable injury, the architectural and other drawings being especially in danger of utter ruin. In this state of things the trustees have appealed to the public for subscriptions which shall assure an annual income of at least five thousand dollars to defray the current expenses of the school, and for the maintenance of the building, until such time as the legislature will consent to take charge of it. It seems hardly possible that in a manufacturing community, whose prosperity depends so greatly upon the development of industrial art, this appeal will go unanswered, especially if its energies are no longer to be taxed to maintain the Permanent Exhibition. That an enterprise so eminently profitable to them should be in any danger of failure, when the comparatively disinterested and patriotic work of the Centennial Exhibition met with such splendid success, would seem to show that in Pennsylvania, as elsewhere, the main springs of action are not altogether selfish.

THE sanitary condition of our crowded summer resorts has begun to engage the attention of thoughtful men. At Coney Island the drainage of three hotels, to which another will soon be added, flows into a shallow estuary behind them, whose state already gives rise to anxiety, and stories come to us of outbreaks of diphtheria in country boarding-houses, of hotel guests poisoned by filthy milk, or ice taken from ponds of sewage, of vacation tourists brought home with typhoid fever, and there are few to whom the watering-place "summer complaints" are not familiar. The pleasure settlements on the Massachusetts coast are peculiarly exposed to danger from zymotic diseases by reason of the rocky soil which underlies most of them, and the closeness with which the popular ones are built up. In the sandy soil of the more southern coast the drainage which escapes from vaults and cesspools may be long in reaching the wells from which the water supply is drawn, and even then is partly filtered and aërated, but the case is very different on the bare ledges which surround Massachusetts Bay. Here all the water which falls upon the surface, except the small portion absorbed by the scanty soil, finds its way over the top of the ledge, descending in a thin sheet until it finds one of the fissured seams which constitute the only water-bearing veins of such regions, and through them continues its course to the sea. All wells must be sunk to these seams, for in them only is there any chance of finding water. As the region is settled the leakage of vaults and cesspools must inevitably follow the same course, as there is no other, and every one of these seams, which are often long and widely branched-subterranean rivulets in fact — which is once reached by the stream of filth, is thenceforth dangerous to health, if not to life. We know that the typhoid infection has been carried a mile in such a seam, and a virulent case of fever in a favorable spot might infect a whole settlement, as a spark fires a train of gunpowder. The diphtheria contagion, though more obscure, we know can be spread in the same manner, and its attacks are even more violent and sudden than those of typhoid. The best security for the individual house lies in the total rejection of well-water in such places. The rain-water supply in summer is peculiarly scanty on the coast, but a scarcity of pure water is better than an abundance of poison, and those who are resolved to secure the conditions of health for themselves can do no less than to try also to avoid contaminating the water supply of their less careful neighbors.

WITH the revival of building comes also quarrelling as to the mutual rights of the parties to contracts. For the benefit of those interested some newspapers have been publishing remarks upon mechanics' liens which should be taken with allowance. The object of the lien laws is to protect the comparatively helpless workmen against the contractor, their employer, who may pocket all the money he receives on his contract, or whose other creditors may trustee his payments, the result in either case being that his workmen are deprived of their wages without fault of their own, while suits against him for their due would be of little avail. To remedy this, the law gives them a property in the building they have helped to construct, independent of any stipulations between the owner and contractor, which they can claim by giving public notice in the manner provided by law, but not otherwise, so that the owner, if no such notice is recorded within the legal time, is freed from any subsequent risk, and if he foolishly pays the amount of the contract before the period for filing liens has expired, and afterwards is compelled by means of them to answer for the contractor's dishonesty, he has only his own imprudence to blame. The time allowed varies in different States from thirty days to three years. In the first case it is sufficient to reserve the final payment till the term has expired; where the period is longer, the contractor should furnish bonds to secure the owner against liens. Some States provide that a formal notice given to the workmen by the owner that he will not admit liens from them deprives them of the privilege in regard to any work done subsequent to such notice. In one of these ways it is always practicable for a prudent man

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to make himself safe. Liens for materials, where they are allowed, are even more easily dealt with. If those who propose to build would more often consult those whose business it is to advise them honestly, instead of putting themselves, as many of them do, utterly in the hands of a mechanic often unknown to them, whose every interest is opposed to theirs, we should hear less complaint of the uncertainties of contracts.

The American Institute of Architects have printed the reports of the proceedings of their last two annual conventions, and, as an experiment, have separated the Appendix, which contains the papers on various subjects which were read before them on those occasions, into a small pamphlet by itself, of which a certain number are offered for sale through the bookstores. Some of the papers are well studied and thoughtful productions; those on fire-proof construction, for instance, comprise information never before collected, and may be said to form the only general view yet published of the present state of this branch of building science; while others are light in character, and hardly worthy of, as indeed they were not intended to have, a permanent place in the literature of the art. It is, however, a desirable object to bring more prominently before the public the subjects discussed and the information gained at the conventions of the Institute, matters which are of interest to a large portion of the public, and would be made more so if the public learned to look to the Institute for them. Another year we hope to see the experiment repeated. Not only will the Institute find its account in securing the best authorities on the most important subjects to write its papers, but the publicity given to the papers will tend to eliminate the writers who know they have nothing to say, and will call forth the best efforts of those who have, so that both the public and the profession will gain in a geometrical ratio. There will be no lack of interesting topics, or of competent writers on them, for a long time to come, and the Institute, with a little energy, can do much good in collecting and recording such information on professional subjects, — a work which has never been done for architecture with half such thoroughness as for medicine, law, or other branches of liberal study.

A case is mentioned in a late number of *L'Architecte* where a proprietor sought to hold his architect responsible for the rotting of his floors under peculiar circumstances. The beams had been filled in with a concrete of plaster and *décombres*, but without waiting for the roof to be covered in, so that the work became soaked with rain. As soon as the building was enclosed the proprietor ordered the floors to be laid, and the ceilings to be plastered. Soon after the beams showed signs of dry-rot, and the floors were all removed, and the beams replaced with the best and dryest timber which could be obtained, the cost of the repairs amounting to nearly half as much as the whole contract price of the building. The proprietor, being now in a greater hurry than ever, as soon as the plaster filling seemed tolerably dry, had the ceilings put on and sized for decoration; but soon afterward the new beams also showed signs of rot, the disease appearing to begin in the places where the moisture had been slowest in drying out of the plaster. *L'Architecte* thought that if the architect had had proper control of the work he would have been responsible for negligence in allowing the beams to be enclosed above and below before the plaster between them was perfectly dry, under a decision of the Court of Bourges, which reads, "The architect is to blame for faulty execution, even though it be in obedience to the instructions of the proprietor: the special knowledge of the architect makes it his duty to point out to the proprietor the objections to the mode of construction proposed, and if necessary to resist even his positive orders;" but as it was shown that the proprietor had made his own contract with the builders, who were unknown to the architect, and had without consulting him imposed upon them an obligation to finish the building in a time clearly too short for its perfect execution, it seemed that he ought to be discharged of at least a part of the responsibility, and if it could be shown that he had fully explained to the proprietor the danger he incurred, undoubtedly he would be so relieved. It does not appear whether any award was actually made as to the architect; probably not, as up to the date of the paper the testimony seemed to have only gone so far as to exonerate the builders, who were proved to have furnished good material, and to have used it wrongly under compulsion.

THE OPEN FIRE-PLACE. — XV.

With any of the fire-places mentioned herein a flue for disposing of the ashes may be constructed below the grate, as shown in Fig. 123. The flue forms an ash-pit, into which the ashes fall from the grate when shaken or dumped. The ashes are then removed through the door B, in the basement at the bottom of the flue. A "soufflet" pipe, D, has been provided, through which air may be taken from below to increase the draught, when desired, after the principle of the Winter Fire-Place; but the soufflet, in a well-constructed fire-place, is unnecessary, and its use is only to be recommended when better construction is impracticable.

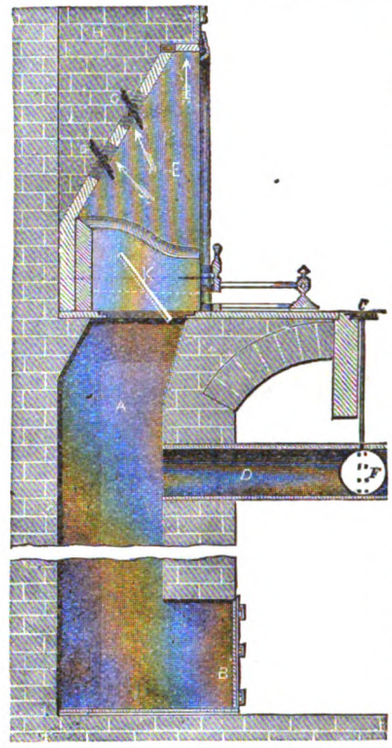

Fig. 123.

In the Fire-Place represented in the accompanying cut, Fig. 124, called the "Franklin Reflector," the smoke circulates behind and below the fire, as indicated by the arrows, in order to increase the radiating surface of the heater. But no fresh air is brought in contact with these surfaces, and they are not arranged in the manner best calculated to give out their heat. The reflecting surface over the fuel is intended to perform the double office of reflecting the rays of heat from the fire into the room, and

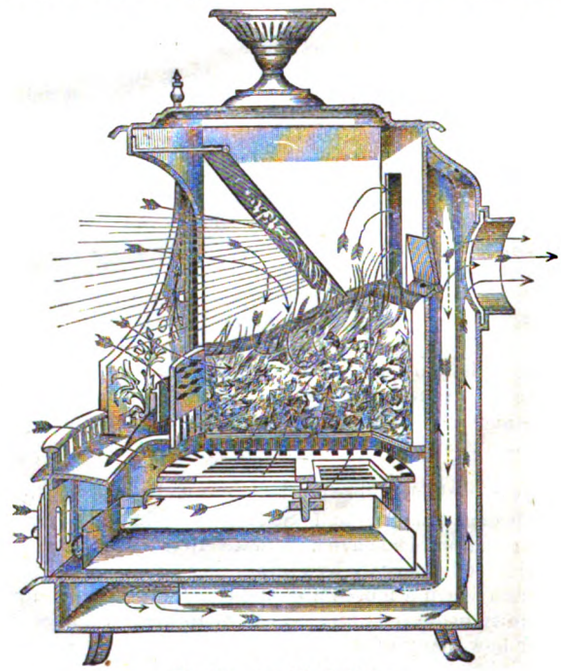
Fig. 124. Franklin Reflector.

of turning the currents of air from the room upon the fire, thus securing the greatest amount of radiation, and producing a more complete combustion of the fuel, while it also diminishes the amount of cool air entering the chimney flue. The same objects were accomplished by the Fire-Place of M. Touet Chamber, already described in Figs. 42 and 43, where the precaution was taken to provide openings above the reflector, for the purpose of carrying the smoke directly into the flue when the fire was first lighted. We believe that, with certain modifications hereafter to be suggested, the Franklin Reflector may be made to combine in the form of a stove most of the advantages possible to be obtained by an open fire-place. It is manufactured by James Spear & Co., of Philadelphia.

To conclude our historical sketch, we have reserved a fire-place described by Peclet in his "Treatise on Heat," and shown in Fig. 125, as the best in principle, and one which, though crude and defective in form, is yet most likely to lead to important results.

The principle of this device is the formation of the chief heating

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surface above the fire-place, and in the waste space behind the chimney-breast, rather than in the immediate neighborhood of the fire.

The great advantages of the arrangement are (1), the acquirement

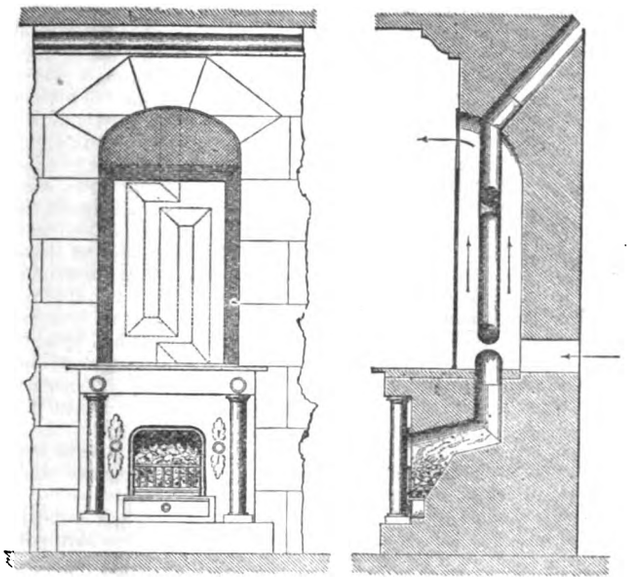

Fig. 125. From Peclet.

of ample room in the waste space of the chimney-breast for the proper development of the heating surface; (2), the removal of this surface from immediate contact with the fire, by which it may be overheated to the injury of the fresh air, and finally destroyed; (3), the detachment of the air-heating surfaces from the fire-place proper, which may, therefore, be made of any form or material desired. If the fire-place already exist it may be left untouched, except above, where it has to be connected with the air-heater; (4), the facility with which the heating surface may be reached for cleaning, repair, or renewal without disturbing fire-place or mantel; and, finally (5), the simplicity and cheapness of its construction. Notwithstanding its evident advantages, the principle was left undeveloped, and as the apparatus described by Peclet was defective it was abandoned. It was seen that the bends in the smoke-flue and the reversed course of the smoke were liable to injure the draught and corrode the pipe. These difficulties were easiest removed by simply pulling the pipe out straight again, which was accordingly done at once, and all that remained was the original Galton flue. Thus the problem was solved somewhat after the manner of the Gordian knot, and the device was summarily consigned to oblivion. Thus it is that the fire-place of to-day stands in practice nearly as it did at the time of Gauger. The English, whose national fondness for the old open fire-place ought to have led them to study its utmost development, seem, with their characteristic slowness to adopt new and foreign methods, to have

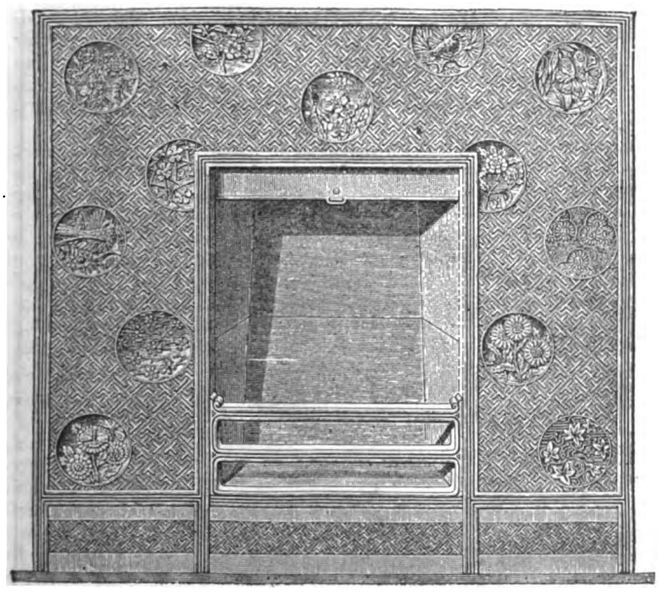

Fig. 126.

stubbornly refused to follow any other course than that laid out for them by Rumford.

The Germans are satisfied with their porcelain stove.

The French have been so busy working up the Gauger fire-place that they have not yet thought of looking behind the chimney-breast to reflect upon the waste of useful space; and the Americans have been too busy with everything else to give the subject any thought at all.

The fire-place given in Figs. 126 and 127, for instance, just brought out in England with éclat, indicates the tendency in that country. A correspondent of the London *Times* of January 30, 1877, writes of

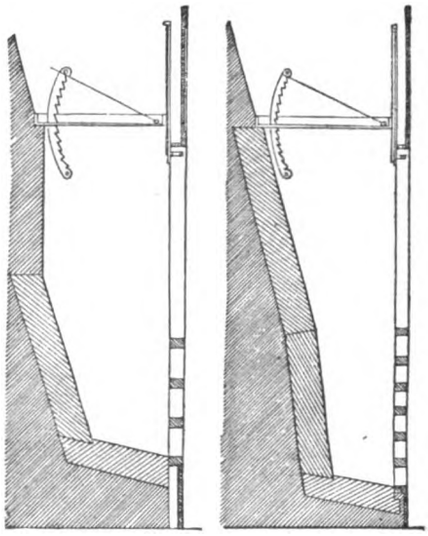

Fig. 127.

this form of fire-place: it "has excited much attention, for I have received in two days more than two hundred letters on the subject, to which printed replies will be sent in a few days. Many of these letters are from hospitals, public schools, military and other public institutions," etc. Yet they are nothing more than a modification of the Rumford grate, and yield, at the utmost, but from 5 to 15 per cent of the heat generated by the fuel, while they retain all the radical defects of the ordinary fire-place.

Constructed upon a principle quite the reverse of that of the Franklin Reflector, they are set high, and are in form high, narrow, and shallow, instead of low, broad, and deep. They have the advantage of heating the floor better for being set high, and occasion less dangerous draughts around the feet. Their shape is favorable for the slow combustion of coal, and for radiation; but they are not suitable for burning wood, since their depth is not over 4½ inches from back to front at the base, and 5½ inches at the level of the top bar. The floor of the fire trough is of fire-brick, and not of grating, so that air passes into the fire through the front of the grate, and not under it. This causes the coal to burn slowly, and each coal glows on the side toward the room. Coke, with a small admixture of coal, may be burned in them, instead of coal alone.

The Englishman, proud as he is of his careful arrangements for domestic comfort and luxury, is outdone in this most important particular even by the inhabitants of distant Asia. The Persian enjoys his pipe before an open fire-place as much more rational in construction as it is more pleasing in appearance than the comparatively miserable object now receiving the commendation of the civilized Briton. The picture at the end of this chapter shows us a cheerful fire sparkling like a gem in a casket so high and ample that its radiating power is utilized to the best advantage, while the hood and sides serve the purpose of a stove in heating the surrounding air and objects by convection and radiation.

The direct rays of the sun are necessary to the complete development of animal life, and the great difference in the amount of radiation of solar light and heat in the various parts of the globe causes a marked difference in national character. Where the sun cannot be enjoyed, or where its rays are feeble and insufficient, the open fire-place becomes its natural substitute, and so long as our physical natures remain the same, so long will the open fire be cherished as a priceless boon and companion.

It is a provision of nature that there shall be a wide difference between the temperature of our bodies and that of the air about us; and we find that the greater that difference, within certain reasonable limits, the more energetic and vigorous is the action of all our animal functions. Air entering our lungs at a low temperature near freezing point, does, as we have said, twice as much work in purifying the blood as the same amount of air entering at the temperature of our bodies, and in winter with the warm rays of the sun striking us we feel twice as vigorous as we do in summer, when the air is hot and suffocating.

When a room is warmed by an open fire the walls are warmer than the air, because radiant heat has the remarkable property of passing through air without raising its temperature. Thus the occupant breathes air refreshingly cool, while the walls, being comparatively highly heated, do not absorb his animal heat with inconvenient rapidity. Nevertheless the outside air must be tempered to a certain extent before entering the room to avoid the danger caused by cold currents striking our bodies, and it is the object of the vent-

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ilating fire-place to temper this incoming air to the proper degree, without waste of fuel or labor.

We have reviewed the progressive steps already made in this direction up to the present time, and we find the utmost that has been accomplished, to our knowledge, by any form of fire-place, in the way of utilizing to good advantage the heat generated by the fuel, has been a saving of from 30 to 40 per cent, applied rarely to the best advantage in preparing and distributing the fresh air for our use. At its best, it is looked upon as a luxury too expensive for the poor man to enjoy. Under the assumption that the element of wastefulness is a necessary condition of its being, he turns, as his only resort, to the closed stove. The efforts of the inventor are therefore directed to increasing the economy of the heater which is used where the value of economy is best appreciated, to the neglect of the open fire-place which he has been accustomed to look upon as incurable.

It is the duty of those who entertain a contrary opinion, and who have the facilities for putting their views in a practical form, to contribute the results of their investigations to the general fund. Small as may be the value of individual results in themselves, they may yet serve as suggestions from which, in other hands, valuable fruit

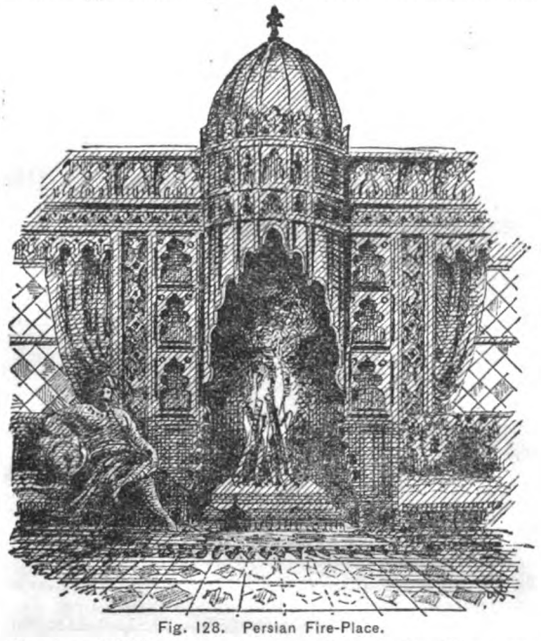

Fig. 128. Persian Fire-Place.

may spring; and little as we may expect to receive from any single contributor, yet the labor of many working together, in the light of past experience and with the aid of the advanced scientific and mechanical knowledge of the day, may, before long, be sufficient to convert the open fire-place from an expensive, troublesome, and even dangerous luxury enjoyed only by the few, into a source of health, comfort, and economy for all.

AMERICAN DRAMATIC THEATRES. — VI.

The orchestra is a kind of debatable ground between stage and house. There are those who cling to the traditions of the past, and consider a full view of fiddlers and kettle-drums to be a legitimate part of theatrical entertainment; and there are doubtless musicians of such sensitive natures that they desire to be seen and personally appreciated, either for their talents or good looks. On the other hand, led by Wagner, there is a large class who would make the orchestra a concealed "music box," filling the scene with "sounds and sweet airs that give delight" and reënforce the effect of the actors' words. These consider the personality of the performer an intrusion and offence, and only wish him represented by the product of his art. The new custom has many advantages. It gives the musicians greater ease and freedom in various ways, relieving them from all formalities of dress and position while playing. It prevents the confusion in the orchestra, especially at the climax of a play, from interfering with its full enjoyment; and it enables the management to economize in the number of performers without appearing, or perhaps being mean. Of course the leader must be placed in full view of the stage and actors, as well as in a suitable position to control his musicians; and the foot-lights can be made available to light both orchestra and stage. With proper arrangement of the concealed orchestra there is no essential loss of tone or volume of sound, as has been proved by fair trial. At the Wagner theatre, at Beyreuth, this system was successfully adopted for grand opera. The arrangements for the band rarely suit the musicians at first, especially if novel. In time, if well considered and correct, they come to be approved. Each head of a department in a theatre considers his province of the greatest importance and desires all others sacrificed to it, while the public desire is for uniform excellence.

Of exit doors from the hall there should be an ample number, and each one wider than the aisle that leads to it.

Leaving for a moment the consideration of the remaining features of plan, there is something at this point to be said concerning certain peculiarities of construction of special importance in a theatre.

On the ordinary precautions incident to good building, and on the special need of their observance where an assembly of people is unusually exposed to exciting influences, it is perhaps unnecessary to enlarge. Everything that comes within reach or even view of the audience must be made extra strong. The cracking or snapping of some unimportant railing or other fixture, the burning of a play-bill over a gas bracket, or some such trivial occurrence, has been known to lead to serious results; and the chances of such events must be carefully considered, and so far as practicable guarded against.

In erecting a theatre it will be well to study carefully the rules laid down by Captain Eyre M. Shaw of the London Fire Brigade, whose valuable suggestions can scarcely be improved upon and should form the basis of state protective building laws for structures of this character. Captain Shaw says, that "it must be conceded that no theatre can ever be constructed fire-proof." He undoubtedly uses the term fire-proof in its strict sense; as he says elsewhere. "The two objects to be attained are these: first, to save the audience; secondly, to save the property; and these objects will be best accomplished by subdividing both audience and building into as many separate risks as possible, and so arranging the general stowage of the contents as to prevent that sudden blazing up which has hitherto constituted the special danger of theatres." . . . . . "Although a theatre badly built and imperfectly protected is not only dangerous in itself, but a source of danger to all buildings in its vicinity, nevertheless there is no difficulty whatever, unless expense be ranked under this head, why a theatre should not be so constructed, divided, and otherwise laid out and arranged, that it might contain a smoking-room, and if necessary, even kitchens, with as perfect safety as the present refreshment saloons, and at the same time insure the absolute safety of the audience and the partial safety of the building and its contents in case of fire." It may be said in comment on the above, that "expense" *is* the principal difficulty with which the architect has to deal in endeavoring to secure safety, under existing laws in America, with the prevalent notions among clients, and the apathy of the people when not specially roused, and their lack of reason when they are.

The stage should be divided from the hall by a brick wall not less than a foot thick and carried at least four feet above the highest part of the roof. The openings through this wall should be as few as practicable. In this the writer differs from the authority just quoted, who advocates openings at every landing. Some few openings are necessary, the one for the curtain being the largest. The others needed should be closed by fire-proof doors, double, or if possible with an intervening lobby. The multiplication of openings increases the chance of some of the doors being neglected and left open. The difficulty in compelling the constant use of safeguards in a theatre is a hundred times greater than any opposition to their introduction in building. The closing of the curtain opening has long been a matter of serious controversy. Some have strenuously advocated sheet-metal, others wire on the Davy-lamp principle, and others woollen or felting backed by wire, and kept wet by a sprinkling-pipe when needed. It is perhaps well not to insist on any one of these for all cases; as one might be better in one place, and another under different conditions. The chief objection to the iron is its weight, and the necessarily powerful machinery needed for working it, and the constant danger that it may fall into disuse. Whatever barrier is employed should be in constant use as the regular curtain, and no other should be allowed except for the "drop" between the acts. The prompt lowering of the usual green curtain and act-drop combined, has been known to hide a serious fire from the audience and confine it to the stage until it could be extinguished by the ordinary means.

The stage should be separated from the dressing rooms by brick walls. The hall should be cut off from the lobbies and stairways in the same way, and the connecting doors should all be of fire resisting materials, and the stairs and passages of exit should be sufficiently protected to hold out against fire for a reasonable time. Brick walls for the smaller partitions are not always necessary. Iron and stone are treacherous and unreliable. A good, strong, framed partition of heavy studding, filled in solid with brick, in mortar, or concrete, or plaster, and wire lathed on each side and plastered, will hold its own against a fire for hours. This will cost as much as brick, but occupies much less room and is not so heavy. A staircase supported on large square timbers, built into brickwork at the ends, the space between carriages being plugged solid with coarse mortar, and the rake and under side of landings wire lathed and plastered, will remain serviceable after one of stone and iron has been destroyed. As Captain Shaw has well said, wood cannot be destroyed by heat and water as stone and iron can and even when exposed to the direct action of flame, if the sticks are large, it will last for a long time.

For doors those of solid wood covered both sides and edges with sheet-iron, or even with tin, are preferable to plate-iron ones. They are lighter and not so liable to get bound in the frames; in case of fire the wood supports the thin metal and the metal prevents the flame from reaching the wood. In the case of a conflagration in a lumber yard some years ago, such doors or shutters in a brick wall resisted a fire that consumed high stacks of lumber, piled nearly against them, until it burnt itself out, and were then intact and serviceable, and the premises they shielded uninjured.

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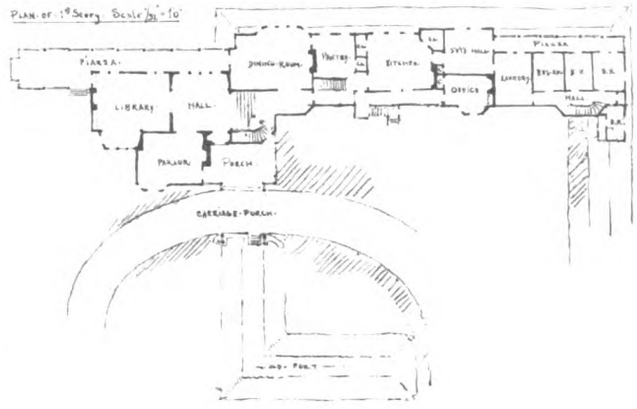

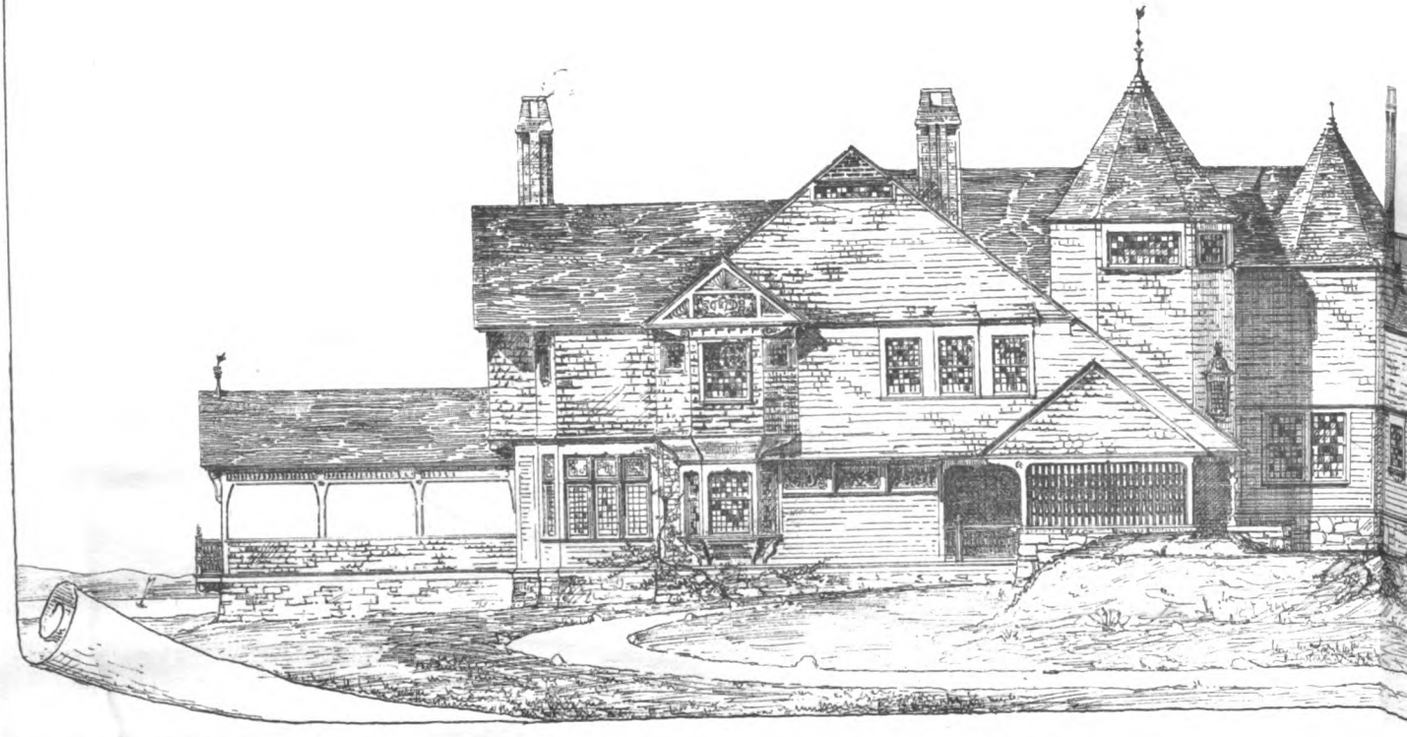

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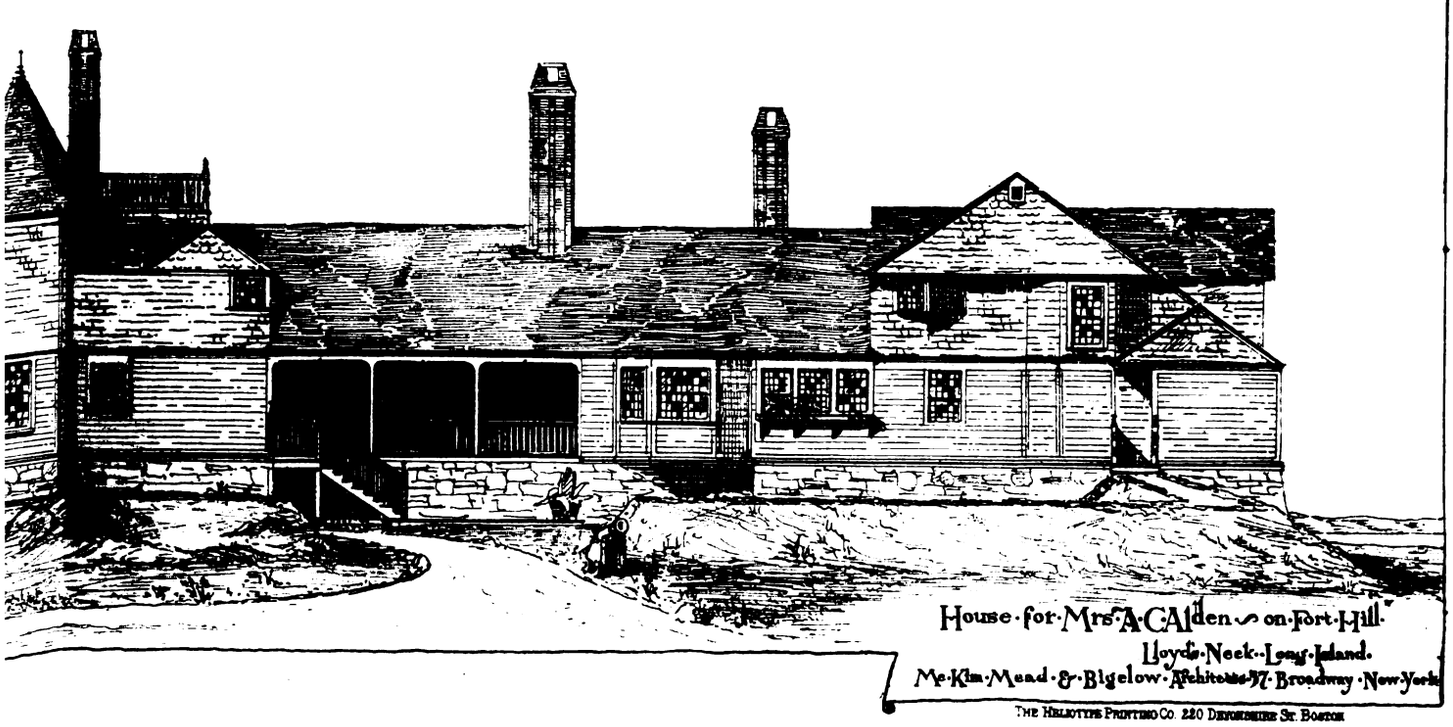

House for Mrs. A. C. Alden on Fort Hill.
Lloyd's Neck, Long Island.
McKim, Mead & Bigelow, Architects, 57 Broadway, New York.

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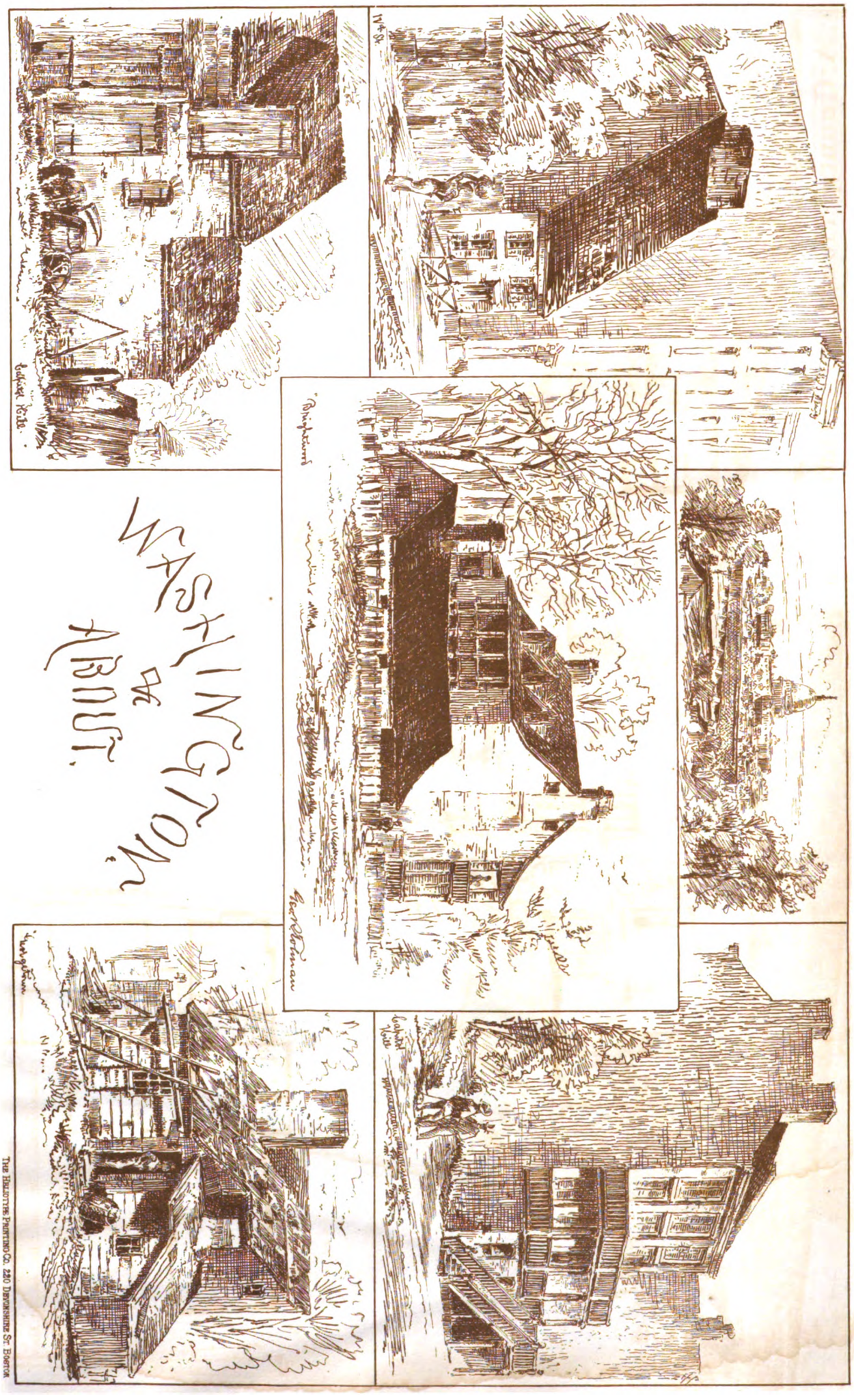

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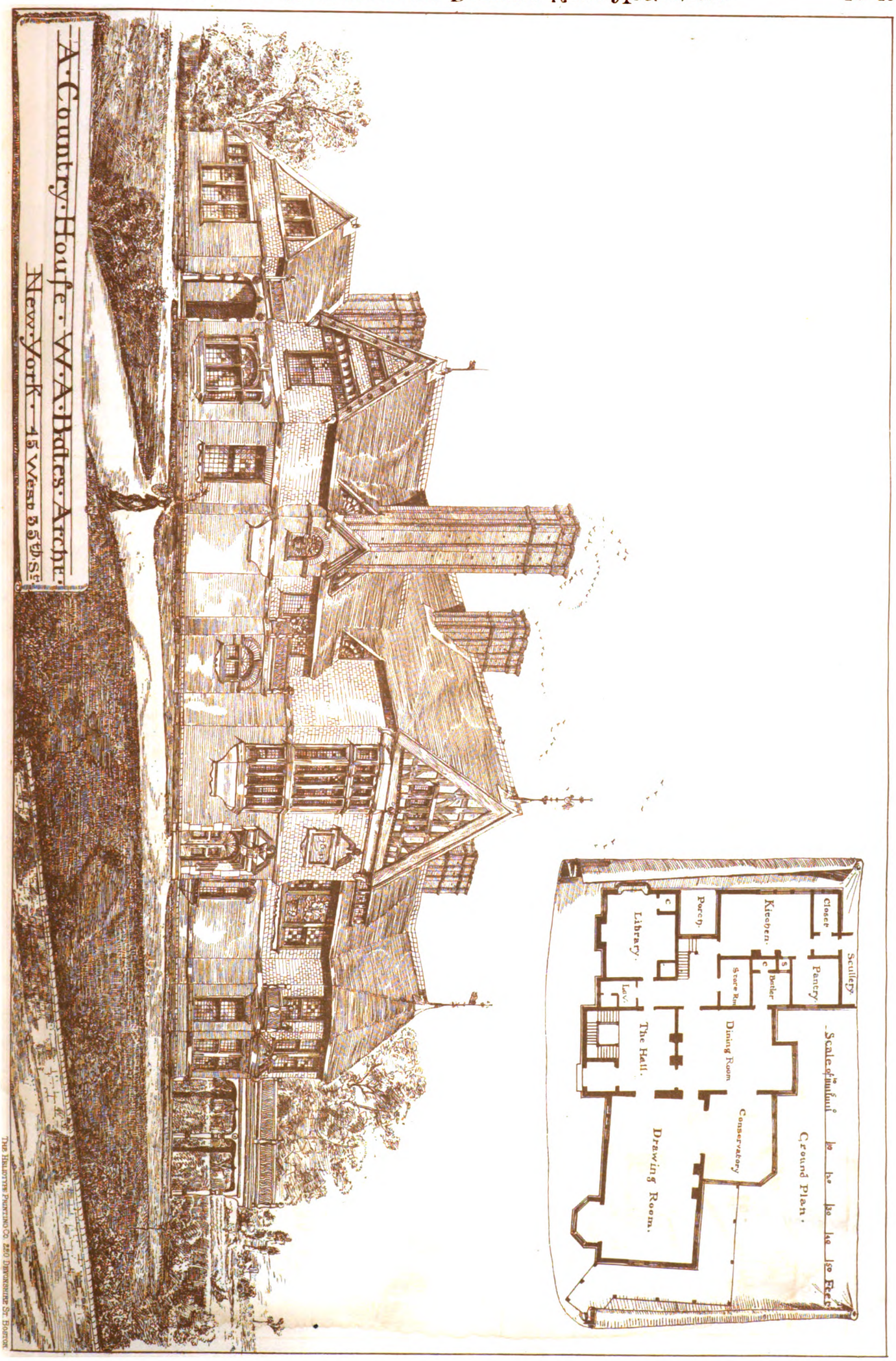

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ARTIST.

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To return to the plan of entrances. The numerous doors of exit from the hall should open into lobbies or ante-rooms with sufficient standing room to accommodate that portion of the audience who have direct access to them. The lobbies and passages should be so planned as to avoid counter or cross currents of people; such currents being turned in one and the same direction before being allowed to mingle. The number as well as the size of the exits should be controlled by the size of the audience, and there should be at least two good ways out from each section of the hall. No projections into passages or stairs should be allowed, and there should be no narrowing towards exits; but right angle turns on stair landings or in corridors are a safeguard, as they reduce the force of a rush by dividing the pressure. Double strong hand-rails for stairs and passages are indispensable. All doors should open outward, or move freely both ways, and should be purposely made light and thin so that they could be easily broken through in an emergency.

The danger of a rush through a long wide passage is that the slow and weak may be overtaken by the swift and strong and be knocked down and trodden under foot. In case of a sudden check and crush the swaying from side to side may throw down women or children, who once down cannot get up again, and are suffocated or trampled to death. Women are often dragged down by those behind treading on the trains of their dresses. Captain Shaw says: "In long straight passages, where the pressure of a crowd might be likely to accumulate so as to become dangerous, perfect safety can be obtained by placing at intervals strong barriers running from alternate sides, and so arranged that not more than fifty or some such limited number of persons could press on each other at a time." Such an arrangement presupposes wider exits than are ordinarily available, and longitudinal divisions, which he also suggests, would answer the same purpose, with less waste of room and inconvenience to the public; although the end would be better accomplished by thin strong partitions rather than by rails three feet and a half high as he recommends.

Of course it is desirable to provide, in convenient neighborhood to the hall, suitable retiring rooms and lavatory accommodations for men and women, and these and the saloons or *foyers* for promenade and conversation, should be made as roomy and attractive as circumstances will allow. Proper cloak rooms should be located near the entrance, but so disposed that the current of the entering or retiring audience may not be checked or hindered by those waiting at such places. The box-office should also be located so as to be convenient to those buying tickets at night, without its "cue" being an obstruction to those who have procured seats in advance.

While taking all proper care for the safety of the public the entrances and their appurtenances should be so arranged as to require the services of as few attendants as consistent with entire security.

If this is not done the number is likely to be reduced by the management by closing some doors of exit. The architect may not be responsible for such abuses, but it is his duty to promote all proper economy consistent with more important considerations.

It has been suggested that plans of exits should be posted in different parts of the lobbies. Also that signs of direction should be painted on the walls. These are well as additional precautions; but such arrangement of parts and conspicuousness of doorways that the crowd will, without special thought, flow out at the places intended, are vastly more to the point. People do not read when panic-stricken. They are often blind, deaf, and dumb, and their intellects, for the time being, are paralyzed. Following a sort of animal instinct they rush *from* danger by the paths by which they advanced towards it, and it is very difficult to divert them in any other direction. Very few people are competent to guide their course by a plan, at the best, and very few would stop to study one. Plain directions for exit, printed on the play-bills, may prove of some use; but as a suggestion of danger is in a measure the creation of a danger, great care must be exercised in all such matters. J. A. F.

THE ILLUSTRATIONS.

WASHINGTON AND ABOUT. SKETCHES BY MR. G. R. TOLMAN, ARCHITECT.

DESIGN FOR A COUNTRY HOUSE. MR. W. A. BATES, ARCHITECT, NEW YORK.

HOUSE FOR MRS. A. C. ALDEN, LLOYD'S NECK, LONG ISLAND, N. Y. MESSRS. MCKIM, MEAD & BIGELOW, ARCHITECTS, NEW YORK.

SEWER GASES AND DWELLING HOUSES.[1]

DOCTOR DE VARONA is a homœopathic physician in Brooklyn, who gained much distinction and a valued decoration by his services in the Spanish army in Cuba during a severe epidemic.

He has taken up the subject of which his little book treats, in an original and thoughtful way, and it gives much evidence of strong personal interest in the subject and much intelligence in its treatment. If any adverse criticism is to be made of it, it is that it covers too much ground for a small hand-book; that in some points, though by no means in many, it discusses matters of somewhat hypothetical scientific value and of little public interest; and that it gives the impression of treating technical branches of the subject with only such knowledge concerning them as can be gained by reading. At the same time, these defects are but minor ones, and the originality of the author makes his intelligent comments on the main features of the subject really valuable. It is a book which will be found suggestive and valuable by the most experienced, and which cannot fail to be of great use to those who take up the subject for the first time. As a hand-book for a doctor to give to patients whose ills may be more or less due to defects in the drainage of their houses, it is better than anything else of the kind that we have seen. Its brevity and its simplicity are, from this point of view, great merits.

Concerning house drains we are told: "Whatever differences there may be in the name, it is perfectly clear that these house drains are nothing more than small private sewers lacking in their construction the engineering skill that is generally used in the public ones, and abounding therefore in the conditions that generate poisonous gases. If they are made of porous material, of unglazed pipe, of metals rough in their interior, if they are badly jointed, if they are unevenly laid so as to have bends and hollows, if they have sharp curves, or run in horizontal lines, if they have falls at right angles, deposits take place, which decompose and act precisely in the same manner as stagnant sewage."

The means for the admission of sewer gases through traps, etc., are thus stated: "Many traps are so constructed that a rush of water passing them will syphon them and leave them empty; especially when, as is often the case, their calibre has become much reduced by deposits. Secondly, because in cases where the trap is not frequently used, the vaporization of the sealing water leaves it open for the passage of gases. Thirdly, because sewer gases saturate water very readily and pass through it with the greatest ease, it taking only fifteen minutes for ammoniacal gas to react upon litmus paper through a trap sealed by a column of water two inches in depth.

"Under these circumstances, the forces that determine the passage of gases into the apartment are the following: The lesser specific gravity of sewer gases (carbonic acid excepted) as compared to atmospheric air, which causes the former to displace the latter, ascend in the pipes and pass through the openings. The excess of pressure in the sewer arising from the backing up of water in the outlets. The impact of winds and the sudden filling of the pipes with rain-water. The direction of the descending column of water establishing a current of air in an inverse direction. The draughts generated in houses by chimneys, closets, dumb-waiters, and elevators, which establish a demand for air from every possible source. The higher temperature of the house air as compared with that of the drain and sewer, causing the latter to rush in through the smallest crevices."

One or two points in the author's practical directions indicate that he is hardly a reliable guide for the construction of drainage works. He proposes to deliver the ventilator of his soil-pipe through the kitchen chimney. This would be very well if the kitchen chimney were *always* to be warm; if the house were never to be left unoccupied for a single week. This condition we can never be sure of. When the house is vacated and the chimney is closed, there will, during certain conditions of the atmosphere, be a downward current in one or more of the chimneys, and it may be in the kitchen chimney, which would have the effect of drawing back into the house the foul gases escaping at the top of the soil-pipe ventilator. This method of ventilation, although a favorite one with many plumbers, has been, so far as we know, entirely abandoned by sanitary engineers. For the ventilation of the sewers, or as an accessory thereto, and as a further aid to the ventilation of the house drains, it is proposed to have "horse-post ventilators" three feet high at the edge of the sidewalk in front of all houses. The obvious objection to this is met by the suggestion that foul air discharged under the noses of foot passengers will be at once oxidized and rendered harmless. This will hardly be accepted by an ignorant public as a sufficient justification for introducing at the very worst point in our streets the smells of the sewer. Nor, we believe, will it be accepted by engineers as having any practical value. If, as seems to be the case, sewers are best to be ventilated by openings into the streets, these openings certainly should be in the middle of the street and at its surface. That is, at the greatest possible distance from the sidewalks and from the fronts of houses.

As might be expected from the profession of the author, the most valuable portions of the book are those which relate to the composition of sewer gases and their relation to health and disease, and to the very important matter of the influence of soil moisture (which means damp cellars), and the possible influence of the contained gases of decomposition within the soil. "The class of diseases most frequently noted in connection with ground water, as revealed by damp cellars, are phthisis pulmonalis, inflammatory diseases of the respiratory organs, especially bronchitis and pneumonia, rheumatism, more particularly of the chronic order, chronic perversions of digestion; also, a lessened power of resistance to all diseases when contracted.

"In order to ascertain the influence of dampness upon health as indicated by the rate of mortality, we should examine the effect of a wet atmosphere, and compare it with that of a dry one. The number of deaths from consumption in towns which are naturally dry is so much smaller than in towns situated on a water-logged soil, that many authorities hold the ground water alone responsible for the production of the disease."

[1] *Sewer Gases, their Nature and Origin, and How to Protect our Dwellings.* By ADOLFO DE VARONA, A. M. L. L. B., M. D. Of the Royal Order of Epidemics, etc., etc.

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The following is at least suggestive as to the use in bedrooms or bedroom closets of stationary wash-basins which are not separated from the drain by mechanical traps. "Before retiring for the night the bed-chamber should be thoroughly ventilated, and if there be reasons to suspect the presence of sewer gases in the atmosphere of the room, this should be disinfected, after which, if there be a stationary basin in or near the room, its waste-pipe should be disconnected from the room by a temporary trap formed in the following manner: Place the stopper in position at the bottom of the basin, and to prevent its being displaced by a sudden gush of gas (a thing that often happens), put a weight upon it. Stop each one of the holes of the overflow at the top of the basin with a well-fitting cork. Then fill the basin with water to half an inch above the overflow.

"Examine the waste-pipe under the basin and see that the mouth of the overflow fits well over the spout of the basin and is well joined to it; if there is a crevice, a thing that may, and very often does, exist for years without occasioning a leak, fill it in (temporarily) with a putty made of pulverized charcoal and tallow, or with a putty made of one part carbolic acid and four parts of linseed oil mixed with sufficient whiting to the desired consistency. With these precautions it is safe to infer that no gases will find their way through the waste-pipes into the room."

What a dreadful thing it is to live in such a world as this, is suggested by the following, printed in gold on the cover of Dr. de Varona's book: —

"We live upon the back of a huge subterranean monster: its arteries, veins, and capillaries wind in all directions under our feet; its thousand gaping mouths surround us on all sides; its million scenting tentacles follow us into our very houses; we are never out of reach of its fetid breath; what it pours forth from its putrid lungs we take into ours. Is it to be wondered that one half of those who die, owe their demise to this foul communion?"

CAMERON'S PLASTERERS' MANUAL.[1]

The author of this little book says: "After an extended period of practical experience in the plastering business, during which time we have not seen a book of any description devoted exclusively to plastering, we have concluded that it would be a benefit to plasterers in general to write such a work and place it before the public." A wise conclusion, indeed, and on the whole, Mr. Cameron has done his work well, and deserves, what he will no doubt receive, the success which generally awaits books written in the sincere desire to assist the inexperience of others, by persons who know thoroughly what they undertake to teach.

The only regret we have in reading his work is, that in his desire to fill out to the proper dimensions what he had to say, he should have "lugged in" accounts of the composition of the "eminently hydraulic" and water limes, the manufacture of béton, etc., which he does not perfectly understand himself, since he confounds Rosendale cement with hydraulic lime, and which in any case are totally useless to the public for which he writes, and could be learned by others much better out of General Gillmore's book. In another edition, if he will replace this scientific matter, of which, however, there is very little, by some comparisons of the Thomaston, Rockport, Rockland, Canaan, Glenn's Falls, and other rich finishing limes generally used on the Atlantic Coast, and of the black Vermont and the up-river ground lime used in New York, and will also give us his opinion on the causes and cure of chip-cracks, the radiating cracks about the angles of doors in partitions, the small-pox-like disease in which little cones of plaster fly out from the wall, leaving pits, each having at the bottom a tuft of black wool, and the various other diseases which afflict plastering, he will make still more acceptable and useful to the large body of masons, carpenters, builders, architects, and amateurs what is already almost a model book of its kind.

As a matter of general interest we cite the author's opinion that lime should be slaked by first putting on a small quantity of water to moisten the lime and start the process, then adding more, and stirring the lumps constantly. This, as is well known, is contrary to the instructions of Gillmore, the best living authority, perhaps, but it is in accordance with those of Rondelet, who says, after many experiments, that the paste of slaked lime forming on the exterior of the lumps will prevent the slaking of the interior portions unless the lime is constantly stirred. Into the merits of this question we will not enter; it is one which will repay investigation.

Mr. Cameron says also that the old notion that plastering mortar should stand ten days or more before using is erroneous; but he does not give very convincing reasons for it. That the mixture of lime, sand, and hair should not stand long, there is no doubt; but of the advantage of slaking the lime separately some days before mixing with the sand and hair we are ourselves thoroughly persuaded, and trust he will consider the point carefully in another edition before committing himself against a mode of work so inconvenient for speculating builders, but in our opinion, so valuable as a partial protection against the evils which come from bad lime and careless slaking.

Fire-Proof Paper. — Fireproof paper may be made, according to the *Pharmaceutische Zeitung*, from a pulp consisting of one part of vegetable fibre, two parts of asbestos, 1-10 part of borax, 1-5 part of alum.

[1] *Cameron's Plasterers' Manual.* By K. Cameron. New York. Bicknell & Comstock. 1879.

CORRESPONDENCE.

EXCAVATIONS ON DELOS.

The Ægean, July, 1879.

The island of Delos, much as its ancient celebrity promises to the investigating archæologist, has, until lately, been but very superficially examined. The early editors, who, following the example of Stuart and Revett, first made the world acquainted with the beauties of Hellenic architecture, spent only a short time here, and the researches of Blouet were still less thorough. There is not even yet an approximately correct map of the island, — those existing having been prepared without a survey, — while there are excellent special charts of every notable site in Greece, as well as of many of the islands far less important than Delos. This seems strange when one thinks of the study devoted to much less attractive remains, but the reason for so apparent a neglect is a simple one. The place is so out of the way, so desolate, that it is possible to exist here only by procuring the necessaries of life by great trouble and cost from a considerable distance. The island is entirely deserted; it is only temporarily inhabited by a few shepherds who come to tend the flocks of goats that wander among the rocks. Upon what these animals subsist does not appear, the parched ground bearing at this season only a few thistles. A single fisherman's boat has come to this strait to catch for the market of Syra the fish peculiar to this spot, whose flavor was so highly esteemed by Pliny; but if the traveller expects to find upon the island aught that could remind him of the ancient reputation of its inhabitants in fattening poultry he will be bitterly disappointed.

A more discouraging rock upon which to spend the time necessary for thorough investigations cannot well be imagined. It is to this alone that so long a delay can be attributed. The French were the first to undertake the work of excavation, and it has remained in their hands. M. Lebègue, with a small sum, furnished him while at the École d'Athènes by his minister of public instruction, began to uncover from fallen masses of stone the primitive cavern-like fane on the side of Mt. Cynthia, which he supposes to be the ancient site of the Delian oracle. It is well known by the plates and texts given in the *Revue Générale de l'Architecture*, 1874, IV.; and is described at length in the monograph upon Delos, which has subsequently been published (*Recherches sur Delos*, par J. Albert Lebègue, Paris, 1876). The exact acquaintance with this structure was the only direct result of M. Lebègue's work, though his book is a valuable contribution to literature, collecting all that it knows of the island and those points of comparative mythology which concern it. He possibly goes too far in the attempt to render importance to his fane, which is in itself only a half-built, half-excavated cellar, little calculated to support the immense weight of literary testimony, ranging from Homer to Ovid, which he brings to bear upon it. Four years after this beginning, M. Th. Homolle, also a member of the École d'Athènes, commenced the thorough work of excavation, upon which he is now engaged. The whole plan of this Apollo temple, and the forum like place around it, has already been unearthed, a large space in the middle of the city being freed from the superincumbent rubbish. It is impossible too highly to commend the manner in which this is being done. The removal of the earth and formless stones is effected with the greatest care; the architectural members being allowed to remain in the position in which they were found, — a great assistance in deciding their original place, — though here much has been dragged around by the destroyers and robbers of every age. This amateur piracy of antiquities, from which Delos has suffered more than any other Greek city, was inaugurated by Verres, a fit predecessor and patron of the class of which Lord Elgin stands a preëminent representative. The island has been fearfully pillaged; has served as a quarry for every vessel which, while lying to leeward of it, protected against the gales which disturb this part of the Mediterranean, has found leisure to take in a ballast of statues and columns of fine marble, easily to be disposed of elsewhere. Whole ship-loads have thus been carried off, — an evil work in which the English have, of course, been most active, though other nations have not been blameless in this instance. The care of M. Homolle in marking the situation of the architectural blocks, so well worthy of imitation, is thus unfortunately of comparatively little moment here in Delos, stones being found at great distances from the buildings to which they belonged; the architraves and cornices of two different temples lying cheek by jowl upon the plan of a third. The condition of everything is lamentably ruinous, early overthrown, and much weathered, being protected only by a shallow soil. The plan of the Apollo temple can never be accurately determined; from the substructions it seems to have been perfectly normal with pronaos and epinaos of usual proportion, — there were six columns upon the front, perhaps thirteen upon the side. Among the newly-found details the capital of the pronaos columns and the gutter, carved with anthemions and lions' heads, are the most important. Little more can be expected. The temple was of quite a late period, though of graceful forms and good Athenian workmanship. Towards deciding the plans of the portico of Philip and of the building with the curious steer capitals, not much has yet come to light. The former seems to have been always supposed too shallow, having a depth of fully ten inches, while in the latter the steers faced inwards, not outwards, as they are commonly restored. The portico must have had a wooden ceiling, and this accounts for the great attenuation of its columns and their wide intercolumniation. The proportions of a temple front would

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have been out of place if applied to them, supporting as they did only their entablature and so light a roof. More may be hoped for as the work of excavation goes on, special attention not yet having been devoted to these structures. The site of the smaller temple of Artemis (or Latona) has been uncovered, but nothing of architectural moment has been found. It would be pleasing to meet with the cubical altars that were here, the story of which is so well known. The Delians were told by an oracle to erect an altar as large again as the one standing; they doubled its dimensions, and thus had one eight times the bulk of the first, a mistake which caused much speculation upon the cube root of two, — a troublesome question for the primitive mathematicians of that age. The blocks may yet come to light, and show how precisely they solved the problem. More important than the architectural remains are the statues and inscriptions; the latter have been discovered in great number, mostly dedications of the time of the Athenian supremacy — there must be now nearly one hundred of them. The statues are all much mutilated, — chiefly archaic, — and indeed of more direct importance to archæology than to art. A few fragments are of great beauty, apparently of the time of Alkamenes. Most noteworthy among them is a female figure with a male torso, supposed by M. Homolle, according to the analogy of certain terra-cotta figurini, to represent the Rape of Proserpina. These statues, like everything that is discovered, are the property of the Greek Government. I have had occasion before, in a notice of the excavations at Olympia (*American Architect*, No. 120), to speak of the careless and unworthy way in which such treasures are treated. The stubborn neglect of the Greek officials reminds one strongly of a certain fable concerning a dog, told by their ancestors. The case of the Delian marbles seems even more hopeless than that of the Olympian; having been rescued from oblivion by so great labor and expense, the prizes are seized upon and thrown roughly into an inaccessible magazine on the neighboring island of Mykoni, where they will stay for years, the hope only remaining that at the end of the present condition of affairs they may experience a happy resurrection. In the mean time one must be thankful that photographs have been secured of them, some of which have been published in numbers of the *Bulletin de Correspondance Hellénique* for 1879. The work is at present being carried on by a force of between thirty and forty men, and advances southward towards the portico. A pretty little Roman exedra has just been uncovered in so good a state of preservation that by the readjustment of a few overthrown blocks it is nearly entire. M. Homolle thinks to complete his investigations and to have the results ready for publication in the course of two years. An architect will soon join him to assist in the preparation of the plates. The appearance of his volume will be looked forward to with much interest. Among the little dwelling-houses it would be useless to dig; all are too much ruined. They covered the greater part of the city, but must have been of the latest Roman period of the island's history. Built of rubble masonry of the mica schist of Mt. Cynthia, their remains are absolutely formless; only here and there is it possible to pick out a bit of mosaic pavement. In this sadly demolished condition, in which all these traces of antiquity exist, the attraction of Delos depends greatly upon that sixth sense, that powerful second sight which recognizes crowded streets and imposing edifices where lie but shapeless blocks and disjointed fragments. The past history of the sacred isle of the Ægean is reacted before the dreamer upon its deserted shores, a story of splendor and misery without an equal. What could be more happy than the brilliant Delos, — celebrated by poets, venerated by peoples and kings — Hellenic and Barbarian; respected even by pirates, peaceable during wars which armed all Europe and Asia. What more debased than the subjugated and unresisting island, under the yoke of Athens, and bearing, as it were, the brunt of the miseries which fell upon that state; its effeminate inhabitants fattening upon the offerings to their temples, exempt from any manly service, following the meanest of callings — mixers of salves, cooks, manufacturers of eunuchs. It is a history of human immunity from strife and of consequent deterioration, of a state at once venerated and servile. Its commercial importance as the centre of the Ægean, — of the Cyclades which circle around it, — as a port midway between Thrace and Crete, between Asia and Attica, — has been transferred to Syra. Its religious importance utterly passed away with the fall of Greek civilization from its pure height. The philosophers of Greece were full of pity at the decline of Delos, while the early fathers of the Christian Church rejoiced with a malicious glee at its fall. But the island sacred to Apollo has been true in its allegiance. No sanctuary of another faith has ever stood among the ruins of its temples, entirely overthrown as these have been for centuries.

THE GOVERNMENT BUILDING — A LEGAL CASE.

CINCINNATI, O.

SHOULD all things else fail in Cincinnati to form an architectural subject for contemplation, the government building kindly steps into the breach and thoroughly fills any void or vacancy. It has done so for the past five years, and will do so for five years yet to come, no doubt. Things go on but slowly. The seven immense derricks that we spoke of last year are still as anxious, now as then, to grapple with any stone that may come within the reach of their long arms.

The stone is now being set for the fourth story, which is, perhaps, half finished. The openings for this floor, unlike those below (which are all square headed), will have semi-circular heads; above these openings is to come the main cornice and dormer-windows; and then (sometime in the future) the immense roof.

This building, we take it, is the best of the large number of large buildings designed under Mr. Mullett's administration. The main lines are classic in their conception, there can be no doubt about that, the details are a cross between French and Italian, and while they are in themselves good yet one cannot help wishing that some greater master had had control and had throttled the abortion at its birth. The greatest mistake of the building, and one that will last for all time, is, that the first-story columns are channelled in regular courses, in the same manner as the rusticated work of the Italian school; thus giving the appearance of an actual weakness to what should be the most substantial part.

One wonders, as he gazes at this immense pile of granite stacked up in the open court, why the Ohio freestone of which this city is mainly built was not good enough for this building, but was the very thing for Chicago, four hundred miles away, and that we have to go to Maine for the material with which our building is built. These facts will certainly afford food for reflection for future ages.

The case of George H. Pendleton *et al. vs.* Samuel Fosdick *et al.*, lately tried before Judge Foraker, was of considerable interest to the building fraternity in that most of the architects and many of the builders were mixed up in it. It appears that the plaintiffs own the bank building next adjoining on the south the five-story stone-front building that was destroyed by fire last January, as recorded in the *American Architect* at the time, — while the defendants own the destroyed building, who, after the insurance companies had adjusted the losses, retained Mr. A. C. Nash as their architect, and commenced to rebuild.

There was a question as to whether the wall dividing the premises was a party-wall or not, but we leave the question as one of law, and come to the main issue, to wit, as to the strength of the party-wall (assuming it to be such) to sustain the weight it was intended to sustain. The old wall was thirteen inches thick; was built in olden times, when it was supposed that honest work was done; was of hard brick, and laid in cement. The plaintiffs claimed that this wall was insufficient; that it had been injured by the fire from one to two inches; that the iron joists in falling had further weakened the wall by tearing out parts of it; and they brought numerous witnesses who offered voluminous testimony (about 500 pages in all). The burden of proof of course lay with the plaintiffs, and in order to prove their claim they brought on to the stand, as probably their chief witness, Colonel A. L. Anderson, Chief Engineer of the Board of City Commissioners, whose testimony was well received until it come to the cross-examination, when it appeared that his knowledge of architecture was limited to the erection of officers' quarters on the frontiers, and that there was no building in Cincinnati that at all approached his standard of safety, and that if there were any the walls would probably be about ten feet thick.

The burden of the entire investigation seemed to be to ascertain how much the wall had been weakened by the intense heat and the great quantities of cold water thrown upon it during the fire. Most of the testimony seemed to show that the wall had been weakened two inches in depth.

Mr. Nash viewed the old wall (the one so well built) as a mere foundation for his new wall, and, after exhaustive computations, decided it strong enough; and the court seemed to think the same, for judgment was rendered in favor of the defendants. C.

MR. CLARKE'S ESSAY ON "THE HYPÆTHRAL QUESTION.

ASHFIELD, August 20, 1879.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Gentlemen, — After the criticism in your last number (August 16), by Mr. Thomas Davidson of Mr. Clarke's Essay on "The Hypæthral Question," it may interest some of your readers to learn the opinion of one of the most eminent German authorities as to the worth of Mr. Clarke's paper.

Dr. Franz Reber is the Director of the Old Pinacothek at Munich, He is the author of probably the best existing concise history of ancient art, and of a history of ancient architecture, which exhibits not only thorough scholarship but rare good sense. He is also known by an elaborate and authoritative work on the Ruins of Rome, and he has given special attention to the text and the interpretation of Vitruvius.

In a letter to me dated June 19, he says: "Clarke's essay is excellent. I believe that the Hypæthral Question, considered up to this time as settled by Böttiger, is fairly opened again by Clarke's work, and lies undecided, unless a decision be made at once in favor of the Ross-Clarke view. I incline to it, and shall give expression to this inclination first in a critical journal, and then in (the new edition of) my book."

I am, very truly yours, C. E. NORTON.

CURIOUS BEHAVIOR OF LIGHTNING. — A house in the Avenue de Clichy, Paris, was struck by lightning, which followed a water pipe to the earth, and then reascended to the fourth story. — *Les Mondes.*

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NOTES OF EXPERIENCE AND INEXPERIENCE.

34. Stove. — I hope Subscriber will find his client willing to pay for the privilege of breathing fresh air from one of the open stoves made by the Open Stove Ventilating Co., 78 Beekman street, New York, which will warm and ventilate at the same time. For ventilation, without a great deal of heat, a Franklin stove of iron or soap-stone can be had of the Murdock Co., 21 Washington street, Boston, or W. H. Jackson, Union Square, New York. If he insists on heat without ventilation, the soap-stone stoves made by J. H. Serene, 4 Peck Slip, New York, are as cheap as iron, and much better. If he must have iron, the Magee Co, Union Street, Boston, can furnish him with all kinds, beautifully cast and finished, and hundreds of other makers can do nearly as well. The base-burners are the most convenient for hard coal, and are now well made by any manufacturer. The makers will give the size necessary. The Magee Co. make an open stove for hard coal which can be made air-tight by pulling up a kind of lid. This warms very well, and gives good ventilation also. C.

35. Water-Color Paper. — R. B. will find Whatman's Antiquarian paper, in solid blocks or small sheets, very good for water-color sketching. For finished pictures Harding's paper, which has a cream tint, helps the warmth and softness of the work. The French *papier torchon*, though rough, is pleasant to work on, especially in sketching. The Harding paper is comparatively smooth, but if still smoother is desired, the Antiquarian hot-pressed will be found good in every way. C.

NOTES AND CLIPPINGS.

The Proposed Bridge over the English Channel. — In order to give as clear an idea as possible of this gigantic enterprise, it will, perhaps, be advisable, after stating that the viaduct is to span the Channel from Cape Grisnez to Folkestone, to begin at the beginning, or, rather, at the bottom of the sea. According to the Admiralty soundings, the greatest depth of water to be found on the passage is 55 metres, and this only for a distance of some 4 kilometres, about half-way between the Varne Rock and the French coast. This Varne Rock and its neighbor, the Calbart Reef, are destined to play an important part in the scheme before us. The former, situated at 15 kilometres from Folkestone and 20 kilometres from Cape Grisnez, is some 4 kilometres broad, covered with no more than from 2 to 15 metres of water. Being of solid rock, and in a direct line with the projected viaduct, it offers itself as a natural half-way resting-place. This rock has till now constituted one of the greatest dangers to the navigation of the channel. M. De Sainte Anne, however, proposes not only to turn it to account by using it as the foundation for a portion of the viaduct, but also, in conjunction with the Calbart Reef, for the construction of a free port, in which vessels of the greatest tonnage will be able to seek shelter from the storms so frequent in the strait which separates England from France. Both for the construction of this port and for reducing the depth of the water to 20 metres in those places where he will be obliged to construct his columns, M. De Sainte Anne proposes to adopt the method employed in the construction of the Cherbourg breakwater, which consists in dropping huge masses of rock into the sea, and in consolidating them by means of Roman cement. Knowing, however, how continually the Cherbourg Breakwater was destroyed by the force of the waves, it may be permissible to doubt whether M. De Sainte Anne will find it so easy as he imagines to carry out the construction of his port of refuge in mid-channel; but the objections which apply to the superstructure of the breakwater for the port do not, however, hold good when the same system is employed to reduce the depth of water. On the foundations thus established it is intended to raise solid masses of masonry to some 40 metres above the level of the sea. This is, of course, a gigantic work, the immensity of which will be seen at a glance when it is remembered that M. De Sainte Anne does not contemplate attempting in his viaduct any span exceeding 200 metres. The distance from Folkestone to Cape Grisnez being 35 kilometres, it will, therefore, be necessary to construct at the very least 175 immense blocks of masonry on which to place the superstructure. The details of the scheme are not yet decided upon. At the present moment M. De Sainte Anne confines himself to the assertion that it is practically demonstrated by the Cherbourg breakwater that it is possible to find a solid foundation for as many columns as it may be ultimately found necessary to erect to support the viaduct. As to the superstructure itself, he proposes to employ three systems. On the Varne Rock and at the two extremities, where the water is shallow and the exigencies of navigation permit, he proposes to erect solid stone arches which will have nothing to fear from the fiercest tempest. This massive masonry is to be followed by the girder-bridge system, such as is employed in the Charing-Cross Railway Bridge. But to span the deep water he has recourse to the tubular-bridge system as applied by Sir Robert Stephenson in the erection of the Menai Bridge. With these three systems combined, the eminent originator of this gigantic scheme believes that he is not only certain to succeed in crossing the Channel, but also in satisfying the demands of every government concerning the precautions to be taken to prevent the navigation of the English Channel being rendered even more dangerous than it is at present. Taking the Bretagne, which bears higher masts than any other vessel in the world, he has already applied to the French Admiralty to know if it considered that this vessel would experience any inconvenience in having to pass under his viaduct raised to 35 metres above the level of the sea. The answer he received was, that with 150 metres between the pillars and the platform of the viaduct raised to the altitude of 35 metres, neither the Bretagne nor any other vessel would be impeded in its passage. Supposing this scheme to be practicable, there still remains much to be done before the works can be even commenced. M. De Sainte Anne promises, however, to commence operations without delay. He informs us that he will not require more than six or seven months for the scientific experiments and the thorough elaboration of his project, and that a sum of 1,000,000 francs will suffice to pay the preliminary expenses. To raise these funds he has already laid his project before the Chambers of Commerce of France and Belgium, from eighty-four of which he has already received adhesions. M. De Sainte Anne, nevertheless, wishing to give England the option of participating in the honor attached to the achievement of his project, intends shortly to visit our shores, in order to lay the matter before the Government, and to submit his plan to the approbation of the technical societies. — *London Standard.*

Facts about Lightning Rods. — In an interesting article in the *Building World*, it is stated that there is in Carinthia a church which was so often struck by lightning that at length it became the custom to close it during the summer months: this continued until in 1778 the church was rebuilt, and provided with a suitable lightning-conductor, since which time the building has been struck but few times and has suffered but little damage. It was at one time held that the best way to protect a building was to repel the lightning from it, and as glass is one of the best non-conductors, a thick glass ball was placed upon the top of the spire of Christ Church, Doncaster, England, but in 1836 lightning struck the church, shattering the ball and seriously damaging the spire. The carrying out of a theory which in this case proved so disastrous has had a happier result in the Houses of Parliament, London, where Sir W. Snow Harris, who was charged with protecting the building, carried the flat copper bands which were used for lightning-conductors behind the plastering of the walls; and Faraday caused a spiral channel, following the course of the stairs from top to bottom, to be cut in the granite of the light-house on Plymouth breakwater, in which was laid the massive copper lightning-rod. One of the best instances of what may be called natural protection is afforded by the London Monument. This column, some two hundred feet high, is crowned by a bronze flame, which typifies the great fire of London, this flame is in contact with the bars of the iron cage in which it was found necessary to enclose the balcony at the top, to prevent persons from throwing themselves over, and the bars in their turn connect with the rail of the balcony and the hand-rail of the staircase which descends to the ground. It is useless to try to insulate the vane spindle or finial upon a tower or spire by using glass rings; it is better to make this rod the upper part of the lightning-conductor. The earth end of a lightning-conductor should be carried to continually damp earth, or running water, but not to a stone-lined well or cistern, because serious damage is known to have been done by return shocks in cases where the dissemination of the fluid was so checked.

Area affected by Lightning. — Prof. Alfred M. Mayer of the Stevens Institute, writing to the *Scientific American*, gives the following account of an experiment made by him at Baltimore many years since, to show the extent of the earth's surface affected by lightning. One wire of a galvanometer was connected with the water pipes of Baltimore, while the other end of the wire coil was joined to a gas-pipe of the house, situated in the northwestern part of the city. Thus a vast system of metallic wires stretched away three miles to the northwest to the reservoir, and also extended to the gas works, distant two or three miles to the southeast. A thunder-storm was raging at the time at so great a distance in the north that only the illumination of the clouds told when a flash occurred. Yet, whenever that flash took place the needle of the galvanometer was instantly deflected through 10 to 20 degrees. The two occurrences were simultaneous apparently, for no difference in the instant of their manifestation could be detected. Indeed, so sure an indicator of the flash was the galvanometer, that when Professor Mayer shut himself up in a dark room, signaling to an observer of the storm when the needle moved, and receiving from him a signal when a flash of lightning occurred, the signals were simultaneous. The next day it was ascertained that the storm was twelve miles distant to the north; therefore, at least five hundred square miles of the earth's surface had its electrical condition changed at each flash of the lightning.

A Concrete Hotel. — One of the effects of the panic of 1873 was to defeat certain railroad projects in Virginia, and suddenly check the growth in its infancy of a grandly laid-out city near Quantico, in Prince William County, in that State, about thirty miles down the Potomac. New York capitalists purchased there a tract of land — about seven thousand acres. This tract they laid out in streets, avenues, and squares, and named it Potomac City. Mr. Bangs was so confident of the success of the enterprise that he immediately had erected, near the intersection of Potomac Avenue and the railroad, a large hotel. This is a concrete building of four stories, containing one hundred and twenty-two rooms, and cost $68,000. It is well arranged and finely finished. This building, now occupied only by some one to care for it, has long been a wonder to those who have caught sight of it from passing cars or steamers. The enclosure surrounding it having once or twice been cultivated in corn, gave it a still more singular appearance — a hotel in a cornfield. — *Washington Star.*

The Black Mildew of Walls. — Apropos of an observation by Professor Paley, regarding the cause of the blackness of St. Paul's, which he attributed mainly to the growth of a lichen, Professor Leidy recently stated to the Philadelphia Academy that his attention was called a number of years ago to a similar black appearance on the brick walls and granite work of houses in narrow, shaded streets, especially in the vicinity of the Delaware River. Noticing a similar blackness on the bricks above the windows of a brewery, from which there was a constant escape of watery vapor, in a more central portion of the city, he was led to suspect it was of vegetable nature. On examination, the black mildew proved to be an alga, closely allied to what he supposed to be the *Protococcus viridis*, which gives the bright green color to the trunks of trees, fences, and walls, mostly on the more shaded and northern side, everywhere in that neighborhood. Professor Leidy thinks it may be the same plant in a different state, but, until proved to be so, he proposes to distinguish it by the name of *Protococcus lugubris*. — *Exchange.*

The Density of Molten Iron. — An exchange says that some experiments on the relative density of liquid and solid iron show that pieces of pig-iron placed in melted metal at first sink, but in a few seconds rise again and float on the surface. Flat bars of cast-iron carefully laid on the surface continue to float. A solid ball, two and three fourths inches in diameter, lowered into the metal by a fine wire, disappeared completely at first, but rose in a few seconds and floated, with a portion about half an inch in diameter exposed. Since, therefore, in foundry practice, one ninety-sixth is allowed for linear contraction of cast-iron, it is concluded that the finally cooled solid is denser than the molten metal; but, as the sharpness of iron castings points to an expansion of solidification, it is also believed that the contraction that takes place in cooling more than counterbalances the degree of expansion during solidification.

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WE print in another column the full text of "an act to provide for stability of construction and security against conflagration, panic, or other accident in theatres hereafter to be erected in the city of New York." This bill, the text of which was prepared by a committee of the New York Chapter of the American Institute of Architects, embodies all the most rigorous and exacting provisions suggested by experience in the construction and management of theatres, as regards their safety from fire and panic. Whatever may be its fate in the hands of the legislature of the State of New York, it is an important memorandum of progress, and will go far to redeem architects from the imputation of a willingness to sacrifice essentials to non-essentials, security to show, science to conventionalities. The profession, constrained by the exigencies of practice, has been compelled to devote the greater part of its energies and inventive powers to the problem of producing the largest results from the most inadequate means; this tendency to make a show at the expense of the more solid qualities of security has been a characteristic of the times, and architects can hardly be blamed, if, in the service of a public so disposed, they continue to build stud partitions and furred floors, and generally to make the best of the means placed at their disposal. Whenever the profession has had an opportunity to express itself with freedom, as in the papers on fire-proof and sanitary construction by Wight, Hatfield, Lienau, Clark, Pfeiffer, Derby, and others, and in the debates on these all-important topics at every annual convention of the Institute, and at nearly every stated meeting of the chapters, it certainly has not been found wanting in ingenuity, and in boldness of innovation. The bill now before the New York Legislature is the last and not the least of these expressions. It is rigorous and unsparing in its requirements, and if passed and enforced, as it deserves to be, it will not only accomplish the immediate and all-important object proposed, but, indirectly, will compel architecture to modify its conventional expressions in many respects, so as to suit the new conditions of structure. Thus the uncompromising requirement as to the use of "wrought-iron doors," even with the concession of double-battened wooden doors as an allowable substitute, suggests some fundamental change in the design of this important feature, wherever it occurs at the outlets, not only of the passage-ways, but of the boxes in the whole circuit of the auditorium wall; and the substitution of fire-proof material for all the inflammable wood-work which constitutes the greater part of the embellishment of the modern theatre, is another condition, which, if rightly used, must ultimately and legitimately result in a change of character in decorative detail. It is to be remembered that all these requirements, so hostile to the conventional forms of architecture, have been suggested by the very conservators of architectural traditions, and by them will be most loyally observed.

THE bill by its title refers only to the city of New York, but its first section seems more properly to contemplate a much wider field of usefulness in its application. It includes provisions, not only for the construction, but for the management, of theatres, in order to obtain a greater immunity from danger by fire or panic, and the sixty-seventh section provides for daily police inspection and reports, which, with the penalties prescribed, seem well devised to secure a rigid observance of the law in all its details. As regards construction, the leading features are specifications for the building of all partitions in brick; for closing all openings therein with wrought-iron doors; for the complete separation of the stage from the auditorium by a proscenium wall rising above the roof, with its stage opening closed daily by a wire screen; for making roof, ceiling, and floors of the auditorium fire-proof; for excluding from the building all steam boilers, lodging-rooms, workshops and storage; for the establishment of a fire-proof shaft over the stage with glazed openings for the ready escape of flames and smoke; for the protection of gaslights everywhere with wire screens; and for the establishment of reservoirs with stand-pipes, hose connections, steam and hand pumps within, and a hydrant outside. In respect to security from panic, we have elaborate provisions regulating the width and disposition of aisles, staircases, passages, and openings, and the character and arrangement of hand-rails and doors; also sections requiring the surrounding of the auditorium with an area for circulation and escape; the substitution of gradients for steps wherever the difference of level is slight; the securing of seats to the floor; a separate system of gas service for stage and auditorium; also a rigid limitation as to the number of the audience, the accumulation of rubbish, and the storage of properties; and requirements as to the presence of uniformed firemen at every performance, and the posting of regulations in conspicuous places. The papers on dramatic theatres which are appearing in the columns of the *American Architect* set forth more at large the ideal conditions of safety and comfort in such structures, and if this New York bill becomes a law it will not be long, perhaps, before we shall see these ideal conditions in process of realization throughout the country, and the insurance rates for this species of property very materially reduced. The next highest risk on the books of the underwriters is, we believe, on hotels. These should form the next subject for rigid legislative enactments, and we commend it to the consideration of the profession.

THE Building Acts which now apply to many of our large cities have materially changed the relations of architects and builders to the public in those localities. Formerly, if the architect enjoyed entire discretion, he was held, in theory at least, to complete accountability for his work; now, the departments of buildings assume a great part both of his discretion and of his responsibility. Every plan must have official approval, and all workmanship is under the supervision of inspectors, who are in some cases obliged to certify whether the building has been executed in accordance with the approved plans and specifications. It is a question whether, if the State takes upon itself the charge of directing construction, it cannot be held to the same accountability and suffer the same consequences in case of neglect of duty which would otherwise be visited upon the architects whose functions it assumes; and great as is the benefit which such laws confer upon a community in saving them from the malpractices of ignorant and incompetent constructors, a government which undertakes to act as supervising architect for its constituents should take pains to do its work thoroughly. Neither the efficiency nor the composition of our building departments is all that it might be. In Chicago the number of inspectors has been reduced from ten to four, and these are so employed in office work that the supervision of building operations amounts to nothing. In New York the superintendent is authorized to employ eighteen assistants, and these, on the whole, are efficient and intelligent, so that the department in that city forms an important factor in building operations. In Boston, the number of inspectors is now eight, — about half what it should be. Considering the number of buildings, new and old, among which these men are obliged to divide their attention, it is creditable to them that they make their authority felt to the extent that they do; but there is still room for improvement. Officers employed in so grave a duty should combine high theoretical with practical knowledge. Without theory an inspector is helpless outside of his own experience, and can neither judge of the merits of nor modes of work new to him, nor act with confidence in unforeseen contingencies. The comparatively enlightened and energetic New York department has recently employed experts to calculate the strength of the floors in existing warehouses and post a statement of the safe load in

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conspicuous places. Every deputy inspector should be able to make such calculations at sight, and to apply them to trusses and iron-work as well as beams; he should be able to estimate the thrust of an arch or the load on a pier by the processes of mathematics, not by guess, and if he sees a building going up on a doubtful foundation, instead of saying, as a Boston inspector is said to have done, that "if it fell, he should not allow any more built so," he should be able to apply the proper tests at once. The best architects in England are glad to receive the appointment of district surveyors; there is a large field for honorable ambition in that direction here.

The novelist, Miss Ramé, known as "Ouida," in a letter to the London *Times*, complains that the modern Italians are working more havoc in their quiet and undisturbed possession of their national antiquities than was ever wrought therein by any tumultuous incursions of Gauls or Goths. She charges them with having lost all sense of the beautiful and all reverence for art. We lately had occasion to speak in great anxiety of their meddlings with the precious work of Philippo Calendario, in the Ducal Palace at Venice. Now we learn that in the process of modernizing the capital of the world, and making it fit for the residence of the monarch of Italy, and for the seat of government of one of the great powers of Europe, the beautiful Ponte Sisto Fountain has been destroyed; the Farnesina Gardens have been broken up by the new embankment of the Tiber, and avenues three hundred years old have been wiped out. Monuments of venerable antiquity, landmarks in the history of civilization, are daily disappearing before the energy of petty Italian Haussmanns in nearly every municipality of Italy. The country is overrun with jobbers, it is said, and contracts are sold and resold until no one benefits save a few unscrupulous speculators. We fear that this picture is but a phase in the inevitable conflict between the modern spirit of progress which has arisen in Italy, doubtless to the great material advantage of mankind, and the spirit of veneration which prefers to dwell on the past, and to cherish its monuments at all hazards. Another phase of this conflict is the destruction of the Wren churches, the desecration of London Bridge, the levelling of the palace of the Tuileries, and the systematic smashing of duplicate bronzes and other *objets d'art* in the new excavations of Pompeii. These columns have borne witness from time to time that even in a country where all is new, and where there is no antiquity to breed archæological sensitiveness, such marks of progress, if they do not arouse astonishment and dismay, are at least not contemplated with sympathy. But who shall draw the line aright between conservatism and progress?

A firm of billiard-table manufacturers in Manchester, England, have devised and carried out an ingenious scheme, by which, so far as their wares are concerned, they will be enabled to correct what Mr. Gladstone in his famous speech at Chester on Industrial Art termed a national "deficiency in that quality or habit which connects the sense of beauty with the production of works of utility." We commend this experiment to the consideration of manufacturers in this country who would disprove the assertion made in the same address that few of the industrial productions of America have any beauty at all. It is an experiment easily tried, one which will inevitably meet with a quick response from young architects, and bear a golden fruitage. The firm in question, Messrs. Orme & Son, by the offer of liberal premiums for designs of billiard-tables and marking-boards of various grades of cost, obtained about two hundred drawings in response. Prizes of corresponding grades were awarded by a committee composed of an artist of the local school of art, a Fellow of the Royal Institute of British Architects, and a well-known cabinet-maker; and a public exhibition of all the competitive designs was opened, with the understanding that if orders were received on any of the unsuccessful designs during the exhibition a commission of two and one half per cent would be paid, and if the drawings were allowed to remain permanently the manufacturers agreed to pay a similar commission on all tables made from them. Thus, at an expense of $500, this firm has added to the attractions of its warerooms a gallery of drawings, which, in enlarging its resources of design, cannot fail to bring a handsome return in reputation and pecuniary profits. Any firm of cabinet-makers or any manufacturer in any department of industrial art who is willing to expend a few hundred dollars in this manner will be rewarded by a collection of designs, among which a good proportion, we venture to say, will be far in advance of what is now generally accepted as good in the markets of the country. It seems to us an eminently intelligent and business-like transaction. There are plenty of young architects, fertile in design, otherwise inaccessible to manufacturers, who would respond to such an appeal with profitable enthusiasm.

By the terms of articles 1792 and 2270 in the *Code Civil* of France, the architect and contractor of any building are held personally responsible for any vices of construction which may be developed in the course of ten years from the date of its completion. We had occasion last week to consider the manner in which this strict but wholesome accountability of the architect was observed in a case where he allowed a precipitate client to fill in around floor beams with plaster before they were thoroughly dry, a proceeding which occasioned dry-rot and necessitated costly repairs. A correspondent of the *Builder* presents a later case covering the question as to the duration of time within which action may be taken against an architect for imperfect work. M. Parent was employed by the Comtesse de Béarn, in 1862, in the execution of various works about her château at Clêvres. These works were completed in 1863, but in the course of the year 1873 grave defects manifested themselves, and in 1875, twelve years after the architect may be supposed to have dismissed the matter from his mind, he was arraigned as responsible for these defects. After argument, the Court of Appeals decided that the articles above alluded to referred only to the duration of the guarantee, but that proceedings could be held against the offender at any time within thirty years from the date of the discovery of the defect, if said discovery took place within ten years after the completion of the works. This decision has apparently established a new precedent, for according to previous decisions in the *Cour de Paris*, no action could be commenced after the expiration of the ten years. With such responsibilities it is not surprising that the amount of work done during the times even of the greatest French architects is so astonishingly small when compared with that accomplished by their brethren on the other side of the Channel. It would seem that the amount of personal supervision required to insure the architect or builder from ultimate pecuniary disaster would necessarily prevent any such extension of practice as is common in England and America, where cases are by no means rare in which the architect has never seen his work at all, and can never know what scamping has been covered up by specious finish. If practitioners among us were held to such rigid responsibilities as we have described, there are few who would not be haunted by the ghosts of old errors and oversights; few, we fear, who would not be compelled in their new work to exercise far greater care both in the designing and in the execution of it.

AMERICAN DRAMATIC THEATRES. VII.

The grand division of the stage, with its various subdivisions, is the distinguishing feature of a theatre. Without it there would be only a hall of somewhat exceptional but very useful form. The stage adds the main attraction and the chief element of danger. It is a great workshop, in which many trades are daily carried on to produce the mimic scene and all the accessories of a modern play. The larger part of the material used is of a temporary and changeable character, and has to be quickly shifted from place to place and to be frequently altered, remodelled, and repaired, the combinations varying more or less with every new drama. It is for these reasons that metal has to be so sparingly used, on account of its weight and the time and expense required to modify it in any way. And this also has prevented the successful use of steam or other like mechanical power to replace manual labor for the shifting of scenes, etc.

The main divisions of the stage proper are the floor, the sides of which are permanent, but the central part, in width and for a greater or less depth back of the curtain, is usually so framed as to be partially or entirely removable for the purpose of raising or lowering actors, scenery, or properties, during a performance. This floor, which is usually of $1\frac{1}{8}$″ inch hard pine, should slope towards the foot-lights with a pitch of about $\frac{3}{8}$ of an inch to a foot. The English pitch is about one in twenty-four, which is a little too steep. This inclination is given to help the perspective effects of the scenery, to assist the ballet dancer, to give the audience a better view of the actor and his business, and for other minor reasons. Occasionally stage floors have been made level; of course, the manipulation of scenery is much facilitated by a level floor, especially in case of box scenes, as any piece may be set at any part of the stage without regard to height; but the general effect of the scene is impaired, and for perfect stage

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setting the loss by this arrangement seems to overbalance the gain. On very small stages it may work well. Under the stage is the trap room, or mezzanine floor, which is generally from 6½ to 7 feet below the under side of the timbers of the main floor at the front, and is level. This floor is also removable where there is a sub-cellar under. The sub-cellar has depth enough to sink the whole of a scene below the stage floor, say from eighteen to twenty-five feet. Some of the smaller theatres, and very successful ones, have merely the trap-room; and now and then one intended for comedy purposes chiefly has not even that, but only a plain room, in which the scene is set with the aid of very simple machinery. Ghosts are going out of fashion; even Hamlet's father shuffles or stalks on and off at the wings instead of popping up like a "Jack in a box," or coming in through a fixed door in the proscenium, as of old.

There is a decided tendency, especially in the larger cities, to classify theatres — it being found from experience that a different stage, and even a different hall, is required for the lighter pieces, from what is needed for spectacular effects; and it is also found that plays of the latter class can be worked with less of the cumbersome and permanent machinery than was formerly considered essential.

Above the stage there are, on each side, one and sometimes two fly floors, or galleries, above the height of the wings, or side scenes, at a proper height, for working all the borders, drops, curtains, etc. These galleries vary in width, height above stage, and distance back from the sides of curtain opening, according to the relation of the dimensions of the different parts; all such measurements have to be determined to suit each particular case. If one were to settle the exact figures for a model arrangement of stage, the chances would be against his ever finding a case in which they could be employed without modification.

The flies are often connected across the back of the stage by the paint bridge, usually made statitonary, but sometimes to hoist and lower, at the pleasure of the painter. It is better made stationary when practicable, the two vertical frames on which the scene is painted being adjustable at any height, in order to give the scenic artist a firm floor to work on. The luxury of a large paint-room, from which a full general view of a scene can be had and in which the artist can work in comfort and seclusion and with a good light, is seldom permitted in the smaller theatres. Most scenes are painted from a bridge, not over eight feet wide, by top light or gas-light, and are often not fairly seen in their entireness until displayed for the performance. In some cases, on account of lack of height, the larger cloths have to be painted in two sections, the finished part being folded to give room to work on the rest. Scene painting is an art requiring special and technical education. The ordinary artist would be entirely unsuccessful at it. It is done in distemper, that is, with water-colors mixed with size, on burlap, or linen canvas, the canvas being previously sized. The perspective effects are peculiar, the colors change very much in drying, and the effects of gas-light, colored and calcium lights, and other stage effects, have to be very thoroughly understood. To be a really successful scenic artist requires exceptional talent.

Crossing the whole centre of the stage above, usually at a height of forty feet or more, is the tie floor, or gridiron. This is of light joists, covered with slats about three or four inches apart and the same width. It is generally suspended by iron rods from the roof trusses and carries the drums and blocks for raising or lowering the curtains, drops, borders, etc., the lines for the purpose being manipulated by windlasses or otherwise in the flies.

It would be impossible within the limits of these articles to fully consider the subjects of stage machinery and scenery. It is enough to say, that while improvements are being constantly introduced by the many ingenious mechanics connected with our theatres, the tendency in small houses is towards simplification. Plays are written or rewritten to promote this change. Where a few years ago three pieces would be given in one evening, one of them at least with many changes of scene worked with the old-fashioned flats and wings, now a single comedy suffices, each act being one elaborate scene, realistic in the extreme, and prepared for the express purpose. The old hinged pattern of grooves was superseded by the "panorama," and these seem in a fair way to give place to drops and box scenes. The device of flats in two parts, the only too visible central vertical joint being emphasized by the dirty marks of scene-shifters' hands, is changed for the better to a single canvas on which the artist can paint a full landscape; and which, if the stage be high enough, can be hoisted flat, without injury from folding or rolling.

The prompter's position is usually on the right, facing the audience, but sometimes may be on the left. Under his immediate control, by means of speaking-tubes, bells, gas table, etc., should be all the working parts of the house. Near this position should be a room for the manager, convenient to both stage and hall and to a proscenium box, if there is such, and at the same time secluded from the reach of the bores by whom the busy occupant is sure to be besieged. A room for the smaller properties, in immediate use in the piece, should also be provided near this point. The accumulated stock of properties and the shop for making them should be outside the brick walls of stage, as should be the carpenter's shop and wardrobe also. By properties is meant everything movable on the stage, scenery excepted, from a pen to a wheelbarrow, — furniture being of course included.

On the ceiling, or under side of the roof, of the stage should be placed the net-work of perforated pipes known as a "factory sprinkler." The stop-cock of the main that supplies this system should be convenient to the prompter's position and conspicuously located, and to avoid accidents and damage from water should be enclosed in a wooden box with glass door always kept locked, and the use of the apparatus plainly printed upon it. It should be distinctly understood that a fire of sufficient magnitude to call for the use of the water should justify the destruction of the box. Fire on a stage always flashes to the roof, and when up among the borders, etc., is difficult to extinguish, or even to reach with the stream from an ordinary hose, which becomes divided into fine spray by the intervening cordage, battens, and canvas. No man in his senses would be foolhardy enough to climb to the top of a stage after a fire were once well started. The factory sprinkler is always ready at the point of greatest danger. In addition to this, and for ordinary use, there should be stand-pipes with water on and hose attached at every corner and at each level, besides the provision of ordinary chemical extinguishers, buckets of water, wet blankets, and axes. Of course, trained hands to use such implements constantly ready, and regular official inspections to make sure that they are kept up to the proper standard at all times, are absolutely essential to the safety of the public. The men detailed for this work should have no other duties to perform that could interfere with their work as firemen.

Over the stage there should be a large ventilator, the valves of which could be promptly opened to carry off the smoke, and this may also be utilized as a sky-light for lighting the stage. The framework should be of wood and as light as consistent with use, so that the heat of a sudden fire would break the glass and the flame consume the bars rapidly, to give the earliest free draught to the fire in order to draw it away from the curtain opening.

Separated from the stage by brick or other fire-proof walls should be the green-room, which must be as near as practicable to the prompter's position and on the stage level; two star dressing-rooms on the same level; rooms for the supers and ballet above and below; and the regular dressing-rooms for the company. A small room or studio should be provided for the scene-painter near the paint bridge. A retiring-room for the band should be located so that the tuning of instruments may not disturb the audience. Dressing-rooms for men and women should be kept apart, and if practicable be reached by different stairways. The stairways and all connecting passages should be cut off from any possible interruption from smoke or fire from the stage, and if practicable all dressing-rooms should have outside windows for light and air. Ample lavatory accommodations should of course be provided. The actors' quarters, in a large majority of theatres, mean and wretched to an extent little realized, constitute a serious obstacle to any efforts for the elevation of the player or his calling.

The ordinary gas meters as well as the gas supply for calcium lights should be outside the main walls of the building if practicable, as should be also the steam-heating apparatus; or if this is not possible they should be in fire-proof rooms by themselves.

It will be well if most of the surplus storage of material could be arranged for outside the walls, but for the necessary accumulation in constant use rooms should be provided enclosed by fire-resisting partitions and doors.

The heating and ventilation of theatres, although most important, does not differ materially from that of other public buildings, except that the power of the heat of the gas may be employed advantageously in various ways, or may be permitted to overheat and vitiate the air, as is too commonly done. So considerable is this heat, that the steam may be shut off in ordinary winter weather, soon after the doors are opened. The stage dressing-rooms require the usual and ordinary provision. The only real difficulty in regulating the warming and ventilation of the whole building lies in the change of conditions produced by raising and lowering the curtain.

After all, in the larger number of cases of public buildings that have a bad reputation for lack of ventilation, it will be found on investigation to result from bad management. Many very good devices have been rendered useless by neglect and mistaken economy. When the public demand sweet air as an essential part of all entertainments, they will get it, — and not till then. J. A. F.

AN ACT

TO PROVIDE FOR STABILITY OF CONSTRUCTION AND SECURITY AGAINST CONFLAGRATION, PANIC, OR OTHER ACCIDENT IN THEATRES HEREAFTER TO BE ERECTED IN THE CITY OF NEW YORK.[1]

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

§ 1. Every theatre or opera-house or building intended to be used for theatrical or operatic purposes hereafter erected (in the State of New York), or which shall be altered to be used for such purposes, shall be built in compliance with the following regulations relating to its structure: And no building hereafter erected in this State for the aforesaid purposes shall be opened to the public until the same has been inspected and approved as conforming with the requirements of this act by the superintendent of buildings, or a person deputed for that purpose by the mayor of any city where there is no such official, and a certificate in writing of such inspection approved and signed by him is filed in the office of the superintendent of police for the said city; and in case any such building is opened or at-

[1] This bill, prepared by Messrs. Hunt, Dudley, and LeBrun, a committee of the N. Y. Chapter, A. I. A., is still before the State Legislature, although it was committed to the committee of the whole in February, 1877.

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tempted to be opened before such certificate is filed as aforesaid, the said superintendent of police or other police authority of the city shall have power, and it shall be his duty, to forthwith close the same and prevent its opening till such certificate be filed.

§ 2. All the rules and regulations contained in this act, which relate to the management or use of any such theatre or opera-house after its construction, shall be faithfully applied and obeyed by all persons owning, leasing, or having the control of such premises, and all the powers now conferred by law on the superintendent of buildings shall extend to the enforcement of this provision.

§ 3. Every theatre, opera-house, or building hereafter erected, and intended to be used for theatrical or operatic purposes, shall have at least one front on the highway or public street, and in such front there shall be suitable means of entrance and exit for the audience.

§ 4. An open space or area shall be reserved for the evacuation of the theatre, and for service in case of fire or accident, on all sides of that portion of the building containing the auditorium and the stage not bordering on the public highway, or not contiguous to any stairway or rooms provided for the use of the audience. The said open space or area shall not be less than ten feet wide for theatres accommodating not more than one thousand persons, and it shall have one or more outlets on the highway toward the auditorium, which in the aggregate shall not be less than twenty feet in width. Similar independent outlets shall, in addition, be provided toward the stage. For other theatres, the width of the above-mentioned open space and outlets shall be determined by the superintendent of buildings, or person deputed as aforesaid, according to the number of persons to be accommodated, taking into consideration also the height of the building.

§ 5. Each of the above-mentioned outlets shall be provided with a gate or gates opening outward, the full width of the outlet, which shall be set back from the line of the street, so that when opened they may not project beyond the street line. During any performance, said gates shall be kept opened by strong locks; at other times these gates may be closed and fastened by movable bolts or hooks. The above-mentioned open space and the outlets shall be kept free from any obstructions whatever.

§ 6. No superstructure shall be allowed over the above-mentioned outlets on the highway unless the same be built of fire-proof materials throughout.

§ 7. Gradients or inclined planes, the inclination not to exceed one in ten, shall be employed. When possible, to overcome any difference of level existing between said open space or area and the adjoining highway, any steps that may be absolutely required to overcome said difference of level must be located at the outlet on the highway.

§ 8. No portion of any building hereafter erected, used or intended to be used for theatrical purposes, shall be occupied or used as a hotel, boarding or lodging house, or any factory, workshop, or manufactory, or for storage purposes, except as hereafter especially provided for. Said restriction relates not only to that portion of the building which contains the auditorium and the stage, but applies also to the entire structure in conjunction therewith.

§ 9. No workshops or storage room shall be allowed either above or below the auditorium or the stage.

§ 10. No workshops for carpentering, scenery making, scene painting, and decorating shall be allowed in any theatre, neither shall any theatre contain any depots or storage room for scenery or decorations not actually in use; any requirements for the said workshops or storage room must be provided for in a building distinct and apart from the theatre.

§ 11. Property rooms for the storage of furniture and other accessions, not including painted scenery and decorations, may be provided for on the premises, in which case the same must be separate from the theatre by a brick wall, and must be built of fire-proof materials.

§ 12. No store or room contained in the building can be let or used for carrying on any business dealing in hazardous or extra hazardous materials. No lodging accommodation, except for the janitor and the ticket seller, shall be allowed in any part of the building communicating with the auditorium.

§ 13. The exterior walls of all theatres shall be built of stone or brick, and any façade or front constructed of iron shall be backed with brick of such thickness as to make the walls, independent of the facing, conform as to thickness with the requirements of the building law.

§ 14. Interior walls of masonry, hereafter described, shall separate the auditorium from the stage, from the entrance vestibule, and any room or rooms over the same; also from any lobbies, corridors, refreshment or other rooms. Similar walls shall enclose all stairs and landings communicating with any entrance or exit; and shall also separate any actors' dressing-rooms from the stage.

§ 15. A fire-wall, to be built of stone or brick, shall separate the auditorium from the stage; and the same shall extend at least four feet above the roof, and shall be coped with stone or terra-cotta.

§ 16. Above the segment or flat arch spanning the stage opening, there shall be constructed a relieving arch. The intervening space between these arches may be filled in with hollow bricks, or other approved material, to diminish the load on the flat arch.

§ 17. The stage opening shall be provided with a metallic screen or curtain, consisting of a frame-work of wrought-iron, to which shall be firmly attached a netting of iron or copper wire, the wire to be not less than one eighth of one inch in thickness, and the meshes to be not over one inch. Said screen to be provided with a proper hoisting apparatus, made of incombustible material, also with a system of counter weights, made of incombustible material, and to have wrought-iron guides at the sides; when lowered it must rest directly upon the wall below and close all communication between the stage and the auditorium, excepting through one doorway in the middle, which shall be provided with a door of the same construction as the screen. The above-mentioned screen shall be lowered at the close of every performance, and shall so remain until the following performance or rehearsal.

§ 18. In addition to the stage opening, the fire-wall between the auditorium and the stage shall have doorways on both sides of the said opening at the level of every floor or gallery in that portion of the building which contains the auditorium, and all of said doorways shall be provided with wrought-iron doors on each side of the wall, which can be opened from either face at all times. Direct access to these doors shall be provided on both sides, and the same shall always be kept free from any incumbrance. Wrought-iron ladders, securely fixed to the wall on the stage side, shall be provided to overcome any difference of level existing between the floor or galleries on the stage side of the fire-wall and those on the side of the auditorium.

§ 19. All walls separating the auditorium from any vestibule, refreshment or other rooms, also those enclosing the stair-cases, shall be built of brick or stone, and all doorways in said walls shall be provided with wrought-iron doors.

§ 20. All walls, floors, and partitions in that portion of the building which contains the auditorium, the entrance vestibule, or any room or passage devoted to the use of the audience, shall be constructed of fire-proof material.

§ 21. The wall separating the actors' dressing-rooms from the stage shall be built of brick, and the dressing-rooms themselves, together with any passage or corridor leading from the same to the stage, shall be constructed of brick or other fire-proof material, and all doorways in any of the said walls shall be provided with self-closing wrought-iron doors.

§ 22. Any wrought-iron doors called for in this act may be cased with wood, or double battened doors, as hereafter described, may be substituted for said wrought-iron doors, said double battened doors to be made of plank four inches in width and one inch in thickness, laid diagonally and fastened by wrought-iron nails clinched; hinges of wrought-iron to be fastened with wrought-iron rivets, and to be set in flush with wood-work of door; the eyes of hinges to be securely bolted, and the entire surface of the door to be perfectly smooth.

§ 23. No combustible material shall be used in the construction of the roof, and the trusses supporting the same shall be of iron. Large glazed openings shall be introduced in the roof over the stage, together with a large ventilating shaft constructed of iron, or other fire-proof material, which shall be closed at the bottom with glazed sashes made of combustible material.

§ 24. The ceiling of the auditorium, also all decorations and fixtures above or on the sides of the stage opening, shall be wholly made of fire-proof material.

§ 25. All stage scenery and decorations made of combustible material, and all wood-work on or about the stage, shall be saturated with some incombustible material, or otherwise rendered safe against fire to the satisfaction of the New York city fire department.

§ 26. All seats in the auditorium, excepting those contained in the boxes, shall be firmly secured to the floor, and no seat in the auditorium shall have more than six seats intervening between it and an aisle.

§ 27. All aisles in the auditorium shall have at least a width of twenty-two inches for every one hundred persons, or parts thereof, to be provided for; and no aisle shall be less than three feet six inches wide at its narrowest part, and, when possible, the same shall be increased in width, towards the exit, at least one inch for every five running feet, or part thereof.

§ 28. Every doorway of communication between aisles in the auditorium and any lobby, corridor, or passage shall have a clear opening of not less than the full width of the aisle leading to such doorway, and every doorway of communication between the auditorium and any lobby, corridor, or passage shall be provided with a wrought-iron door.

§ 29. The aggregate capacity of the lobbies, corridors, passages, and rooms for the use of the audience must, on each floor or gallery, be sufficient to contain the entire number to be accommodated on said floor or gallery, in the following ratio, viz.: Two hundred and fifty superficial feet of floor room to be allowed for every one hundred persons.

§ 30. Gradients or inclined planes, as herebefore described, shall be employed instead of steps, where possible, to overcome slight differences of level in or between aisles and passages.

§ 31. All inclosed passages, corridors, and staircases shall have on both sides a strong hand-rail, firmly secured to the wall, about three inches distant therefrom and about three feet above the floor or stairs.

§ 32. No passage leading to any stairway communicating with any entrance or exit shall be less than four feet in width in any part thereof.

§ 33. Every theatre accommodating three hundred persons shall have two exits at least; when accommodating five hundred persons, at least three exits shall be provided, and no doorway of exit or entrance for the use of the public shall be less than five feet in width, and for every additional one hundred persons or portion thereof to be accommodated in excess of five hundred, twenty inches additional width must be allowed; all doors of exit or entrance shall open outward and no such door shall be closed and locked during any representation or when the building is open to the public.

§ 34. Distinct and separate places of exit and entrance shall be provided for each gallery above the first. A common place of exit and entrance may serve for the main floor of the auditorium and the first gallery, provided its capacity be equal to the aggregate capacity of the outlets from the main floor and the said gallery.

§ 35. All stairs shall be constructed of fire-proof material throughout.

§ 36. Stairways serving for the exit of fifty people must, if straight, be at least four feet wide, and if curved or winding, five feet wide, and for every additional fifty people to be accommodated six inches must be added to their width.

§ 37. In no case shall the risers of any stairs exceed seven inches in height, nor shall the treads be less than eleven inches wide in straight stairs. In circular or winding stairs the width of the tread at the narrowest end shall not be less than seven inches.

§ 38. At least two independent staircases, with direct exterior outlets, shall be provided for each gallery in the auditorium, and the same shall be located on opposite sides of said gallery.

§ 39. At least two independent staircases, with direct exterior outlets, shall also be provided for the service of the stage, and shall be located on the opposite sides of the same.

§ 40. All stairways leading to the upper galleries of the auditorium shall be inclosed between walls of masonry on both sides.

§ 41. Stairs leading to the first or lower gallery may be left open on one side, in which case they must be constructed as hereafter provided for in similar stairs leading from the entrance hall to the main floor of the auditorium, but in no case shall stairs leading to any gallery be left open on both sides.

§ 42. Stairs leading from the entrance hall or vestibule to the main floor of the auditorium may be left open on one or both sides, provided the

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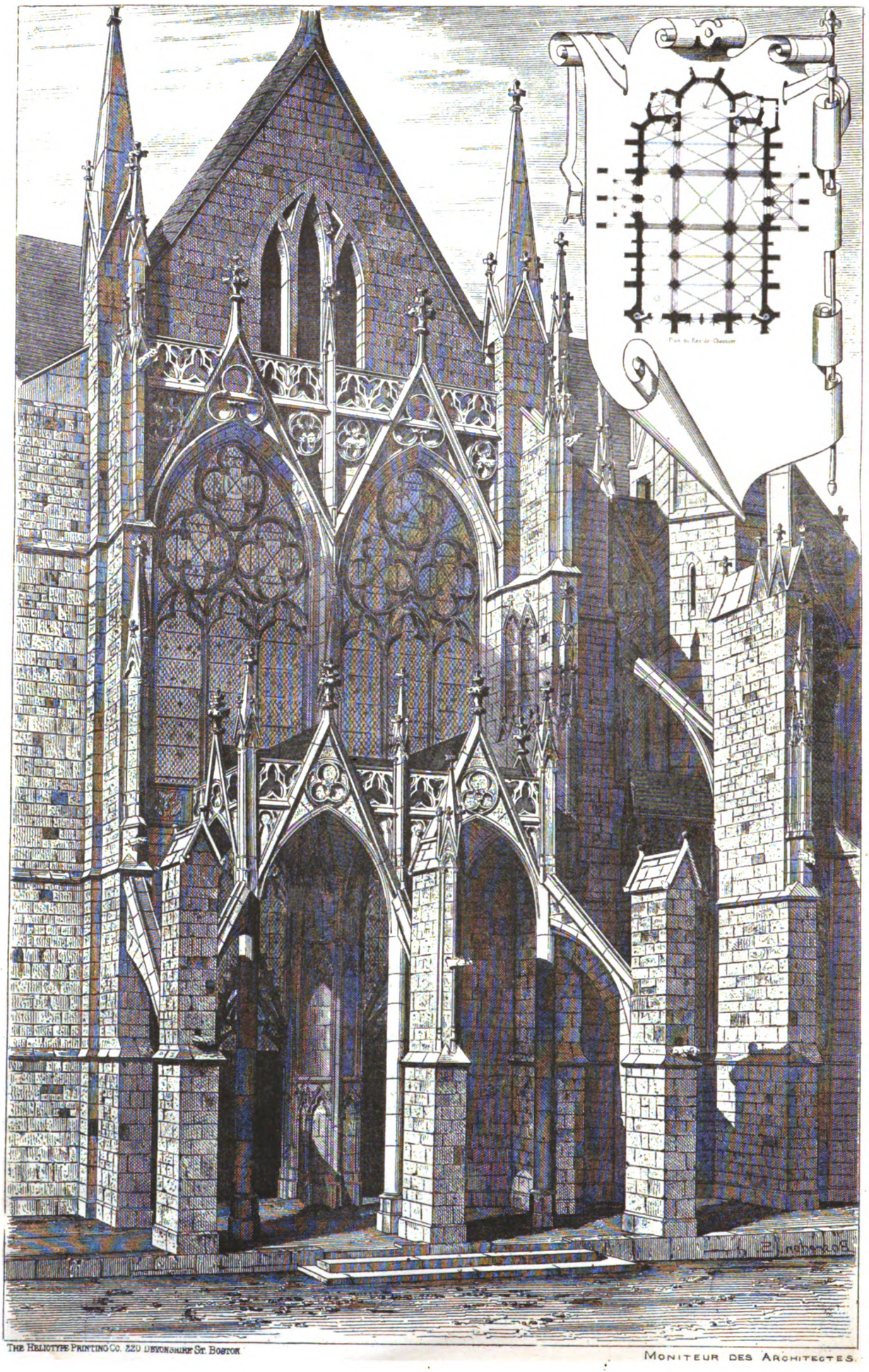

LATERAL PORCH OF THE CHURCH OF ST. URBAIN, TROYES, FRANCE.

Drawn by MR. P. LORAIN, ARCHITECT.

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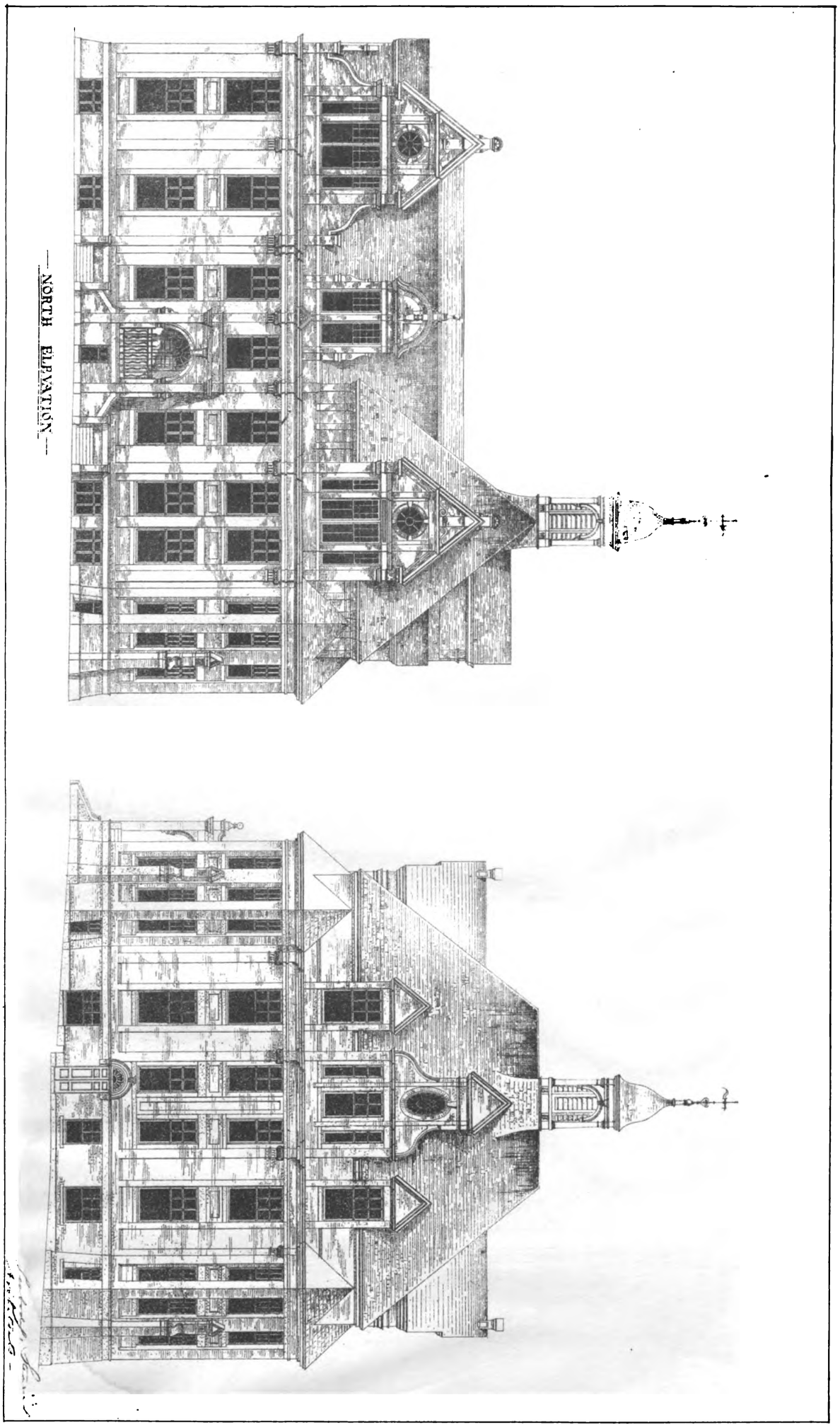

— NORTH ELEVATION —

SKETCH FOR WASHINGTON UNIVERSITY SCHOOL.

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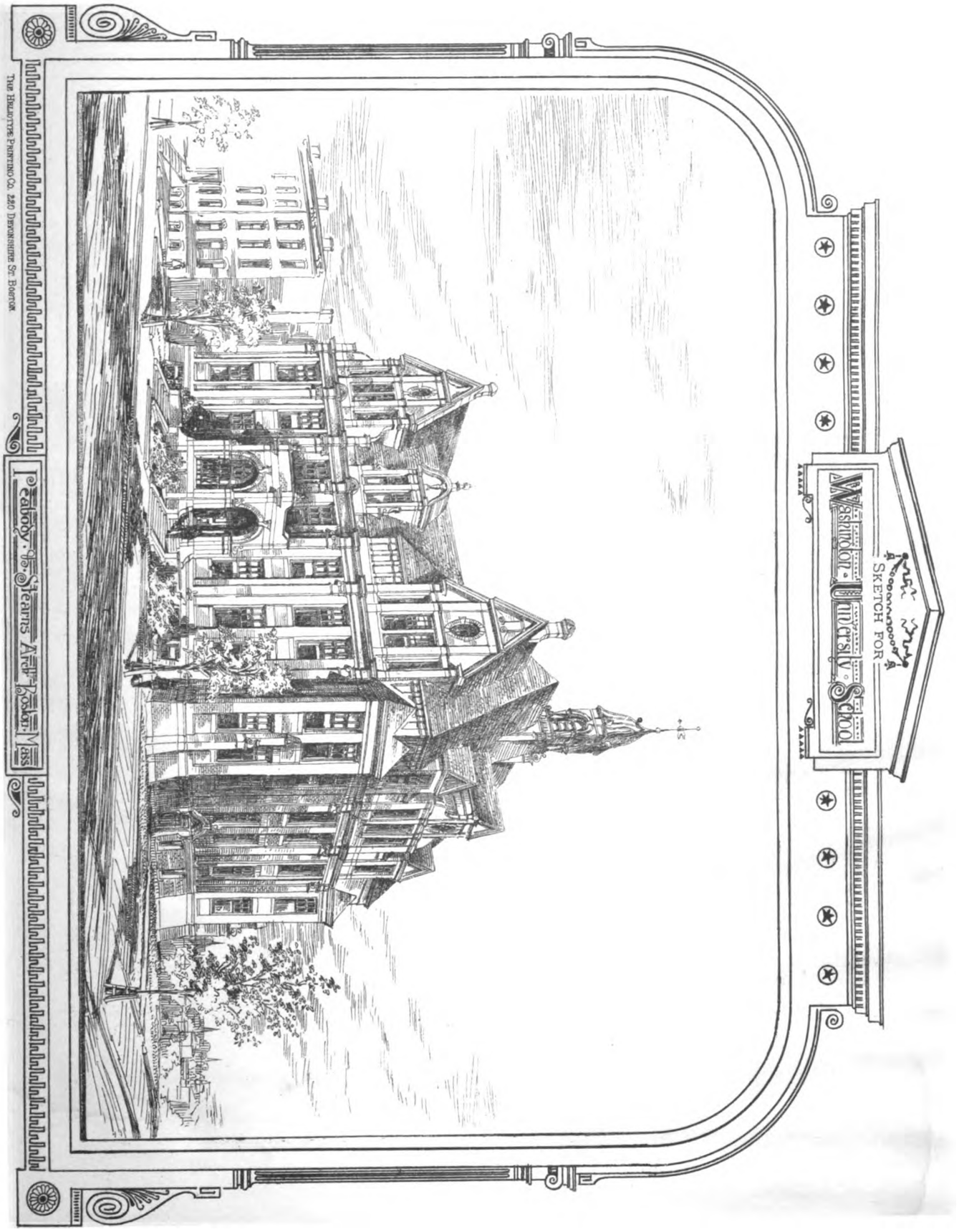
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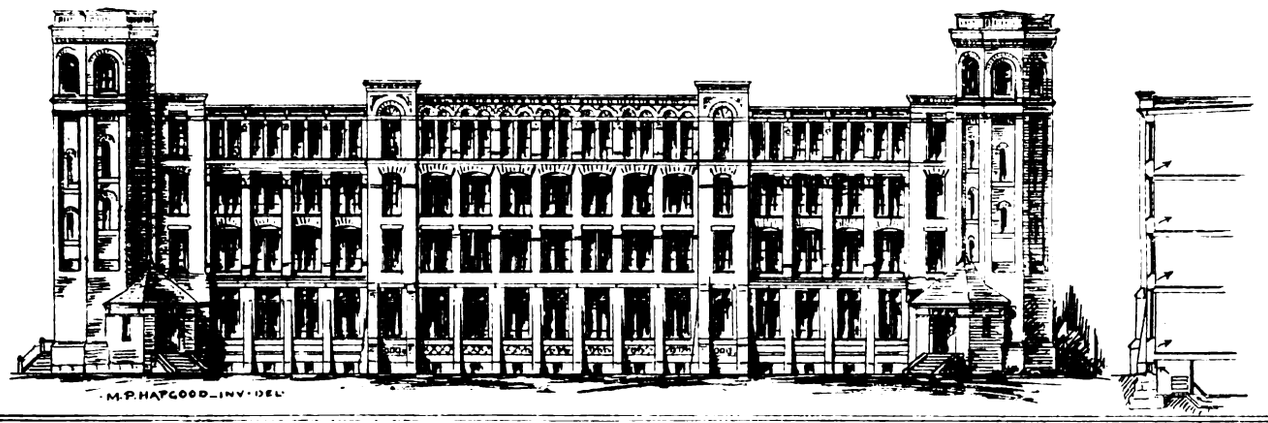

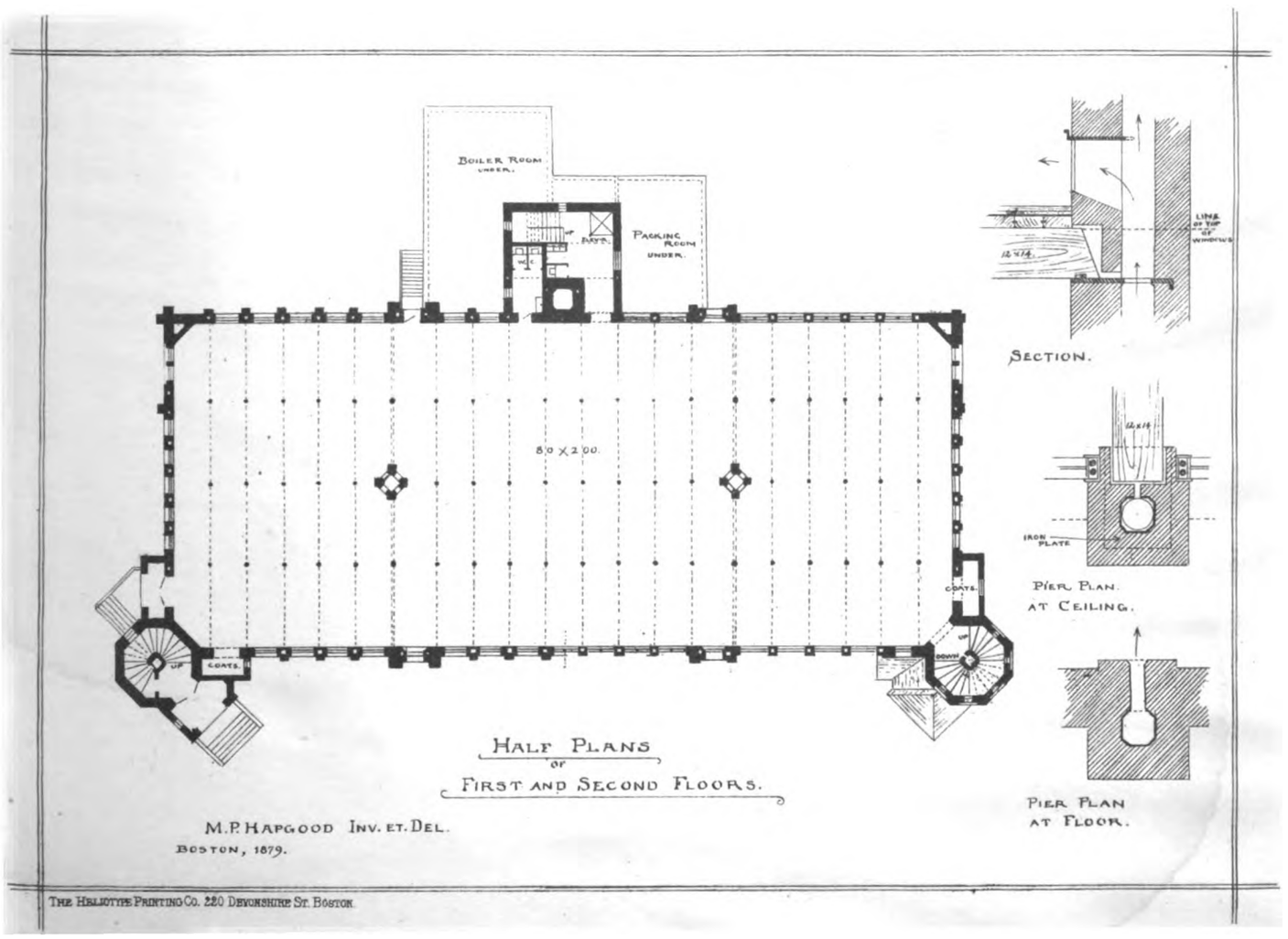

DESIGN FOR A MILL BUILDING.

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same be supported throughout on masonry or iron, and provided also that the end or ends of all steps, not built in or against a wall, have a strong balustrade firmly secured to said masonry or iron.

§ 43. When straight stairs return directly on themselves, a landing of the full width of both flights, without any steps, must be provided.

§ 44. Stairs turning at an angle must have a proper landing at said turn, introduced without winders.

§ 45. In stairs when two side flights conect with one main flight, no winders shall be introduced, and the width of the main flight shall at least be equal to the aggregate width of the side flights.

§ 46. Circular or winding stairs shall have proper landings introduced at convenient distances.

§ 47. All stairs over eight feet wide shall have, in addition to the above-mentioned hand-rails, a substantial railing, securely fixed in the middle of said stairs; an additional railing shall be introduced for each additional five feet in width of said stairs.

§ 48. Provision shall be made for the thorough ventilation of the auditorium, corridors, lobbies, refreshment and all other rooms intended for the use or accommodation of the audience.

§ 49. No stoves or open fires shall be allowed in any part of any theatre, except in the foyer or saloon and in the refreshment room. Nor shall any coils of pipe for heating purposes be permitted in the auditorium, or in any passage or corridor, unless the same be so introduced as to form no obstruction to the free circulation of the public.

§ 50. Any steam boiler which may be required for heating or other purposes shall be located outside of the building, and the space allotted to the same shall be enclosed by walls of masonry on all sides, and the ceiling shall be constructed of fire-proof material; doorways in said walls to have wrought-iron doors.

§ 51. Every theatre shall be provided with one or more steam pumps, with all the necessary appliances and of sufficient power to throw water on any part of the building. The capacity of said pump and appliances to be determined upon by the New York city fire department, whose approval also of any system to be employed must first be obtained in all cases. The said pump or pumps shall be located either in the cellar or on the ground floor in a suitable room which shall be separated from the theatre by brick walls; all doorways in said walls to have wrought-iron doors.

§ 52. Proper and sufficient reservoir or reservoirs, to be supplied with water from the street mains, shall be provided for the supply of the above-mentioned pump or pumps. There shall also be located, in or against the upper portion of the fire-wall between the stage and the auditorium, a reservoir which shall furnish an immediate supply of water to the stand-pipes and sprinklers hereafter described; and all of the above-mentioned reservoirs shall be kept constantly full.

§ 53. Stand-pipes in connection with said pumping apparatus shall be provided with hose attachments on every floor and gallery as follows, viz.: One on each side of the auditorium; also one on each side of the stage, and at least one in the property room, if the same be contiguous to the theatre. Said stand-pipes shall be kept constantly filled with water and shall connect with a thorough system of perforated pipes or sprinklers to be provided both on the stage and in the auditorium.

§ 54. A proper and sufficient amount of hose shall be kept always attached to each hose attachment.

§ 55. There shall also be kept in readiness, for immediate use on the stage, buckets of water, hand pumps, or other portable fire-extinguishing apparatus.

§ 56. Outside of every theatre, street hydrants shall be located for the use of the fire engines, the number and location of the same to be determined by the New York city fire department.

§ 57. A sufficient number of competent firemen, authorized by the New York city fire department of the locality, shall always be in attendance in uniform during any theatrical representation or whenever the building is open to the public, the number in each case to be determined by the said fire department.

§ 58. Every portion of the building devoted to the uses or accommodation of the public, also all outlets leading to the highway, shall be well and properly lighted during every performance, and the same shall remain lighted until the entire audience has left the premises.

§ 59. Gas mains supplying any theatre shall have independent connections for the auditorium and the stage, and provision shall be made for shutting off the gas from the building on the outside.

§ 60. Where interior gas lights are not lighted by electricity, other suitable appliances, to be approved of by the superintendent of buildings or other official deputed as aforesaid, must be provided.

§ 61. Oil lamps or candles shall be kept lighted during every performance whenever the superintendent of buildings may direct, as a precaution against any panic in case of the gas being accidentally extinguished.

§ 62. All suspended or bracket lights surrounded by glass, in the auditorium or in any part of the building devoted to the public, shall be provided with a proper wire netting underneath. All lights in passages and corridors, and wherever deemed necessary by the superintendent of buildings, shall be protected with proper wire network. The foot-lights, in addition to the wire network, shall be protected by a strong wire guard not less than two feet distant. All stage lights shall have strong metal wire guards or screens, so constructed that any material in contact therewith shall be out of reach of the flame.

§ 63. Every theatre open to the public shall be immediately closed if the manager neglects for one day to keep the reservoirs filled with water, the pumps in order, and to provide a sufficient and proper force to attend to the same.

§ 64. The number of persons at any one time to be admitted in the auditorium in excess of the seating accommodation shall be limited by the superintendent of buildings or other person deputed as aforesaid.

§ 65. No rubbish shall be allowed to accumulate in any theatre, but the same shall be removed daily, about one hour before the audience be admitted.

§ 66. All employés of theatres shall be at their respective posts one hour before the audience is admitted, actors and members of the orchestra excepted.

§ 67. The superintendent of buildings, or other deputed as aforesaid, shall cause every theatre open to the public to be inspected and reported upon daily, said reports to be duly entered in writing and signed in a book to be especially provided for that purpose in the office of the department o buildings or in mayor's office.

§ 68. In some conspicuous place on every gallery or floor the regulations for the protection of the public against fire or other accident shall be posted, together with a diagram or plan of said gallery or floor showing distinctly the modes of exit therefrom.

§ 69. All acts or parts of acts, the provisions of which are inconsistent with this act, are hereby repealed.

§ 70. If the regulations and provisions above described do not, for any reason, apply to and cover the entire structure of any building intended to be used and erected for the above purposes, any part thereof not subject to such provisions and regulations shall be erected and built, or altered, in conformity with any law or laws thereof in force relating thereto.

§ 71. This act shall take effect immediately.

THE ILLUSTRATIONS.

A SKETCH FOR THE SCHOOLS OF WASHINGTON UNIVERSITY, ST. LOUIS, MO. MESSRS. PEABODY & STEARNS, ARCHITECTS, BOSTON, MASS.

LATERAL PORCH OF THE CHURCH OF ST. URBAIN, AT TROYES, FRANCE.

THIS illustration, which is borrowed from *Le Moniteur des Architectes*, represents the south porch of the church which Pope Urbain IV. began to build in 1262 in honor of his native city — Troyes. Work on the building was hindered by the monks of the powerful abbey of Notre Dame aux Normains. For this and other reasons the church was never finished, and was consecrated only in 1389, although for more than a hundred years it had been as complete as it was when the work of restoration and repair, now going on, was begun two or three years ago. The church is held to be one of the finest examples of the architecture of the thirteenth century, although even the closest examination leaves still a doubt whether it does not belong after all to the fourteenth century. The dates, however, are incontestible. The plan indicates the general disposition of the church. The porch, which was to protect the entrances in the principal façade, was never built, nor was the façade itself after it had been carried as high as the tympanum of the doorway. A tile-covered lean-to protects that portion of the building from the assaults of weather; the side-doors were protected by porches of remarkable construction, as can be seen in the illustration, the thrust of the vaults being resisted by the three great isolated counterparts, which are so detached from the body of the porch as not to mar its effect. The disposition and size of the piers in the first bays of the aisles indicate that it was the intention of the unknown architect to flank his main façade by a tower on either hand, as well as to have a larger tower over the intersection of nave and transepts; this, no more than those, ever existed, though in place of it a wooden spire was built, but was so often injured by lightning that it was finally removed in 1761.

SKETCH FOR A MILL BUILDING BY MR. M. P. HAPGOOD, BOSTON.

This design is intended to suggest some improvements in the common methods of mill building as regards slow-burning construction, free egress in case of accident, resistance to vibration, lighting, heating, and ventilation. Slow combustion is assured by compliance with the ideas advanced by E. A. in this journal, and needs no description here. Egress from the upper three floors is provided through the two octagonal towers, containing broad stairs centring on a brick core which would be provided at each floor with fire apparatus, the tank-room occupying the upper story of the tower. Separate exits are provided for the first story. Vibration, which exists more or less in all mill buildings, is here resisted by anchoring double, heavy beams into the wall at one end, and at the other into the ventilating flue, which, presenting an angle to the line of vibration, would offer great resistance; in addition, the side piers would be heavily buttressed. The staircase towers also stiffen the walls considerably. By concentrating strength at a few points the windows can be grouped more closely, thus giving much more light than by the old arrangement of single windows. The building would be warmed and ventilated somewhat on the principles advocated some time since in this paper by the writer of School-House Ventilation. A space would be reserved around the basement walls for a heating chamber where steam-coils would be introduced from the boiler-room; the pressure required would be furnished by blowers. Evaporating pans would of course be supplied, and the moisture acquired from the walls would not injure the air. The currents of warm or cool air would be forced through the flues, placed at regular distances, thus drying the walls, preserving the ends of timbers, and issuing at each floor. These small, separate currents would cause no strong draught, but would insensibly warm and purify the room, and would escape through the two middle flues, which would be fitted with automatic hatches at each floor.

CORRESPONDENCE.

THE GIRALDA. — THE ALCAZAR. — THE CATHEDRAL.

SEVILLE.

CHRONOLOGICALLY, the Moorish remains at Seville ought to have been described after those of Cordova, and before those of the Alhambra in my last letter; but this most fascinating of Spanish cities contains so many interesting monuments of different periods, and is so characteristic in itself, that a whole letter devoted to it will be none too much. Its chief monument is the immense cathedral,

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whose crowning glory is the celebrated Giralda tower, built at the end of the twelfth century. The latter in solid grandeur has but one rival, — the tower of St. Mark at Venice. From the two great maritime countries of the Middle Ages these huge beacons signal across the Mediterranean the same note of power and magnificence. The Campanile of St. Mark, though of about the same proportions, has slightly the advantage in size, for which, however, the skilful decoration of the Moorish example more than compensates. The latter is forty-five feet square at the base, and up to the height of 185 feet is old Moorish work; but from this point rises a sixteenth century addition, ninety feet high, whose airy grace crowns not unworthily the solid shaft below. This solidity is cleverly accentuated and decorated by six stories of small but elaborately cusped and decorated windows. On each side of this central motive is a lofty compartment of mural cusped arcades in brick. These motives, in addition to their exquisite design, give scale to the gigantic mass, which thus escapes, with no loss of dignity, the boldness of St. Mark's. The tower takes its name from the weather-cock (*girar*, to revolve) which surmounts it in the form of a bronze statue of Faith, — hardly appropriate for a weather-cock, — which, though weighing 2,800 pounds, turns with every breeze. The early Moorish tower is supposed to have been crowned by four enormous brass balls. The ascent here, as at St. Mark's, is by thirty-five inclined planes, so that a horseman can ride to the top. The inclined plane is a Byzantine characteristic found in St. Sophia and Greek churches, where the ascent to the gallery set apart for women is by an inclined plane. Another peculiarity in the Giralda is that, reversing the usual plan, the walls grow thicker as they get higher, and finally close in like a conical vault, which seems intended to give increased stability.

Opposite the cathedral, at the corner of which stands the Giralda, is the royal palace or Alcazar, and, as its principal hall is of about the same date as the Giralda, it is better to examine it at once. The only façade of the Alcazar which has any architectural interest is reached after traversing several courts, and the visitor to the Paris Exhibition will at once recognize it as having supplied the *motif* of the Spanish façade there. It is light, elegant, and of nearly the same style as the Alhambra. The dainty little colonnettes of the galleries in the second story are of fine marble, and the walls are covered with gold and colors, and yet the general effect is not glaring. The Duc de Montpensier gave $50,000 for the restoration of this façade, which, however, has been clumsily and carelessly done. The entrance to the great central court — Patio de las Doncellas — has lately been changed and complicated, and now one suddenly stumbles into it. Around it fifty-two slender marble columns, chiefly arranged in pairs, support the second story of the gallery. This upper story is Ionic, and appears absurd and paltry above the elegant arcades below, which are beautiful examples of the fourteenth century, and rival those of the Alhambra. The doors, which give access to the apartments opening from the court, are better preserved than those of the Alhambra, and are beautiful specimens of the inlaid work of the period. The celebrated Hall of the Ambassadors was so restored in 1569 that it is no longer a pure example of the best Moorish work, but it still retains its superb wooden dome with inlaid patterns, and the walls covered with stucco tracery, just as I described in my letter from the Alhambra. The azulejos, or tiles, in the dado are of the best period; but a restoration of the sixteenth century added Rococo balconies on each side and a frieze of portrait heads, which must be very valuable to the historian to reconcile the artist to the mutilation of this splendid hall. We must not complain, however, for our generation is responsible for a restoration of the color in the wall patterns, which is still more crude and false in tone than the more recent efforts at the Alhambra. It is a relief to pass from this glare of paint and gilding into the lovely little Patio de las Muñecas, whose dainty proportions and elaborate lace-work of delicate reliefs make it one of the most beautiful Moorish examples. Its present creamy whitewash is certainly more agreeable than anything short of the most perfect polychrome. It is very small, and the three stories of galleries surrounding it remind us that our hideous wells for light in city buildings have been and may be made a beautiful feature in themselves. After this there is a series of handsome halls, all of historical interest, unfortunately proved by the restorations introduced by different Spanish sovereigns who have lived there since they expelled the Moorish princes, down to Queen Isabella of our day. Unlike the Alhambra, the second story offers an important suite of rooms. Among them the most interesting is the tiny sixteenth century chapel, only 15 feet by 12. It is covered with cinque-cento tiles, and is counted the finest specimen of Christian decoration in Spain. Very fine are also the Arabian tiles in a hall near the garden, now used as a stable! The gardens themselves are laid out like those of Italy, with their faults and beauties. Quaint, pretty walks, ponds and water-works, tasteless grottoes and poor architecture; but criticism is disarmed by the brilliant sunlight and shadow which in this southern land is the leading decorative motif; and the works of men, good and bad, are alike but playthings for its powerful display.

A word to those who wish to make studies in the Alcazar. Unlike the Alhambra, permission is with difficulty obtained to work here, and can only be had on applying to the Intendant of the Palace at Madrid, and so the traveller, if coming from the north, will do well to apply when at Madrid.

The Giralda tower stands at the corner of another of these delightful Moorish courts filled with orange-trees, of which I wrote in my last letter. This court resembles that of Cordova in its walls of tapia and lofty horseshoe gateway, but in place of the former mosque, and following its walls, rises the immense cathedral built in the fifteenth century — the largest of mediæval Gothic cathedrals. It has several aisles, the two exterior ones blocked up by chapels. The central aisle or nave measures fifty-six feet from centre of piers, while the total width is 298 feet, with 415 feet for its length, to which must be added a noble Plateresque chapel in the rear. The nave is 145 feet high, and rises to 171 feet at the Cimborio or transept dome. Although the seven lofty walls, crowned with a half Moorish, half Renaissance ornament and flat roofs, externally suggest little of Gothic influence, except at the unfinished transept gable, the interior is no compromise, but frankly and magnificently Gothic. The vast majesty of its mighty piers and lofty vaults can only be compared to those at Milan; but here in the dim gray light there is a solemn simplicity wanting in the theatrical effect of the Italian interior. The aisles are divided into nine bays, and the transepts do not project in plan, but have the height and width of the nave. Here, as in all Spanish cathedrals, the choir is placed in the nave in front of the transept crossing, which thus separates it from the high altar, usually occupying the two corresponding bays behind the transept. As the choir is always walled in — and often the altar — the only place in which the people can at all assist in the service is in the transepts and the crossing, and so to keep open the communication between choir and altar there is a small passage railed off between them, an amazingly ugly device which betrays the incongruity of the whole arrangement. The unfortunate effect of thus blocking up the nave is familiar to us generally by the discussion in England in regard to the rood-screens, many of which have been removed from the cathedrals; but in Spain the result is worse, as the choir occupies a more central position in the nave. As in most of the Spanish cathedrals, the screens of sculptured stone and wrought-iron, the shrines and chapels, sacristies and dependencies form a wonderful museum of art, of which I have not the space to give even a *résumé*. Certain things, however, as typic of Spanish art, I must mention, such as the magnificent gilt *reja* or wrought-iron railing which rails off the choir from the transept crossing, and the one opposite enclosing the high altar. They are formed of lofty iron bars, simply tied together, but crowned by a large gilt design of figures; these are spirited, and often ingeniously arranged to present with the same outline different figures and subjects on opposite sides. They date from the first of the sixteenth century. In general, I may add that no country seems to me so rich in wrought-iron work as Spain, to which may be added the interest of seeing the things in place, instead of collected in museums. The vast retable behind the high altar is a grand specimen of elaborate Gothic carving, with forty-four panels of figure-subjects, nearly life-size. Typical are also the great organ screens, which reach nearly to the roof on each side of the choir. They date from the end of the eighteenth century, in the Rococo or Churrigueresque (from the chief architect of that period) style, and like many works of that age of debased design, apart from their details, produce a fine effect by their fine proportions and sumptuous wealth of ornament. A striking characteristic of Spanish organs lies in placing a certain number of the pipes projecting horizontally, and the monotony of the perpendicular rows is varied with this bold fringe of trumpets. The effect in their sombre churches is startling, and, in a modified form, might help our own hackneyed designs.

I have hinted at the solemn gray light which pervades the vast building; the windows are so high that it is rare to see strong shafts of light anywhere; while there are fewer absolutely dark parts than in many other Spanish churches, this diffused twilight gives the solemn tranquillity which characterizes this cathedral, and which the Spaniards called "Grandezo," or solemn, just as they characterize that of Leon, the Elegant, while strength is peculiar to Santiago, and wealth to Toledo. There are ninety-three windows filled with glass, painted, I think, which is effective if not of extraordinary merit; the best was done by Flemings in the first half of the sixteenth century. Generally speaking, the colored glass in Spain is strong and effective, rather than pure or beautiful; yet in their peculiarly dark interiors the result is nearly always fine, and wins more admiration than finer glass often receives in other countries.

The many pictures, bas-reliefs, statues, etc., worthy of interest, in the side chapels, I must pass over, only remarking that the celebrated San Antonio of Murillo, which in 1874 was cut out of the canvas, and recovered for the Spanish Government by Mr. Schaus, in New York, has been cleverly sewed in again, and shows little or nothing to mark its trip to America. I am unwillingly forced, also, to content myself with the mere mention of the two beautiful Plateresque halls, the Sacristia Major and the Sala Capitular, designed by Diego de Riaño, about 1530. In these all the elegance of proportion and detail which characterize the Italian cinque-cento style is found on a far grander scale, while the ornaments and sculpture are more spirited and realistic than the cold arabesque of Italy. The bas-reliefs reminded me of Carpeaux's spirited figures. There is a concentration of ornamentation in opposition to plain broad surfaces surpassing the best French examples of this period, such as the chevet of St. Pierre at Caën, and the interior of the domes of this style are peculiarly light, and very judiciously decorated.

The Sala Capitular solves the difficult problem of arranging an elliptical plan, 50 by 34 feet, and does so with extreme elegance.

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They both have beautiful marble pavements, as well as pictures by Murillo, while the Sacristia contains magnificent specimens of silversmith's work and gorgeous vestments. There is another smaller but exquisitely designed sacristy by this same Diego de Riaño, who was certainly an architect of the first rank. The great chapel behind the high altar is also a fine Plateresque example. Its dome has an ingenious arrangement of high bas-reliefs in panels, the lowest row having heads with the whole bust, and this is cut off in a higher circle of panels, and higher still the heads are on a smaller scale, which gives lightness to the dome.

At right angles to the cathedral is the Capilla Real, really a good-sized church. It was built only ten years after the death of Diego de Riaño, but its vulgarity shows how soon a decadence can set in after the loss of a master genius, if the art itself is no longer a spontaneous and truthful expression. In Spain, as in France, the revival of classic taste and details produced, when first grafted upon the light and truthful construction of Gothic architecture, a refined and elegant style, which was soon borne down before the tide of a vulgar and artificial period. The beautiful early Renaissance designs must, however, be laid to the credit of Gothic architects, for it may be said that this style lasted only during the life-time of a generation brought up in Gothic principles, which they continued under the new forms. As if to make a fair comparison of the two styles, there are in the chevet of a small church at Caën two chapels, side by side, the one late but very refined Gothic; the other, with exactly the same construction and dimensions, is Renaissance of the time of Francis I. They must have been built about the same time, and certainly show the same qualities in design. Each is extremely elegant, and one must be prejudiced to indicate a preference. If the character of our art requires us to ring the changes on previous styles, we might well have turned aside for a moment on our transit from Gothic to Queen Anne, to learn how classic refinement, when grafted on to the former, can produce something better than the distorted proportions and clumsy details of our last fashion. A fine example of an exterior design in this Plateresque style is found in the city hall, a large, imposing building, though it is not high, and has not the immense roofs which helped French architects so much in their designs. Its delicate mouldings and sculpture are beautiful; unfortunately they are restoring and adding to it, which will probably injure its future aspect.

Now that we have in some sort, guide-book in hand, reviewed these chief monuments, let us, on our way to some of the other many interesting buildings, join some of the lazy, happy painters who are rambling, in aimless enthusiasm, about these charming streets, which the modern Spanish school has immortalized, or which perhaps have immortalized it. At any rate, the heart of an artist can ask no more delicious effects than the splashes of sunshine which here and there invade the pale, cool shadows of these narrow, winding alleys, — for they are hardly streets, the most part too narrow for carriages. They are paved with large flags, kept as clean as a Dutch kitchen. The houses are universally whitewashed; but centuries of these washes seem to have given a soft tone, which, especially in the shadow, is peculiarly delicate. Iron bars defend all the windows, and generally rise, cage-like, from a narrow balcony which projects only enough to give place for flower-pots. All iron-work, gratings and gutters, is painted emerald green, as invariably as the convention for tinting engineers' drawings. This, with the red and blue flower-pots crowding the windows and balconies, brightly relieves the monotony of the white houses, many of which are flat-roofed, with parapets also covered with flowers. Imagine these simple flat walls — there is rarely an architectural feature on them — crowned with brilliant flower-pots, or the yellow and red tiles of the roof itself blooming with blossoming weeds; imagine these walls flecked with sunlight and soft shadows, relieved against a superb blue sky; and you have a fine study of sunlight at every step; and but a few more steps in any direction, and you will close the vista down the street by a Moorish tower, or a fantastic Rococo dome incrusted with the most brilliant of blue and green tiles. Then, for the foreground you will have hardly a minute to wait before a Murillo type of beggar, with his rich brown cloak, appears, or a knot of gypsies, or bright-kerchiefed peasants on their donkeys. When he first enters these narrow streets, a charming surprise awaits the stranger, which becomes, later, a never-ceasing source of pleasure to him. This is the glimpse into the interior courts of the houses through their open doors, — or rather doorways, for the doors themselves are replaced by delicate iron grillage, almost like cobwebs spun across the openings. Through these is seen the cool, marble-flagged court, with statues and palms, flowers and fountains; and here, in the warm evenings, the family gathers, quite indifferent to the gaze of the passers-by. It is a Moorish translation of the Pompeian courts, and one which yields nothing in romance and charm to the more classic life of a Glaucus. Of that life under the shadow of Vesuvius we know by ruins and fables; here one may enter into the living Eastern counterpart of it. The same gay, careless existence; the siesta and idling by day in the darkened rooms; all gayety and animation in the courts and streets by night. The courts of the poorest houses have their flower-pots; whilst those of the wealthy are surrounded by handsome arcades with palms and orange-trees, around a handsome fountain in the centre. The finest of these comparatively modern houses can, however, in no way rival the earlier ones. Thus, in a Moorish mansion belonging to the Duke of Alba there were formerly eleven of these courts, nine fountains, and more than a hundred marble columns. Of this only a portion remains now; that offers a splendid example of the earliest Moorish style. A two-storied, richly decorated gallery about the great court, beautiful Artesonado ceilings and domes, and Persian tiles.

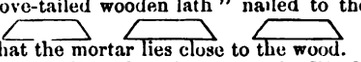
Better preserved than this, but less pure in style, is the Casa de Pilatos. It was built by a rich nobleman and patron of the arts, in the fifteenth century, — but as a close copy of the style of the preceding century; hence there is a strong mingling of Gothic influence in the details. Here, again, are superb wood-inlaid cupolas and ceilings. The Virgin's Chapel is a sumptuous example of this mingling of the Moorish and Gothic styles: its vaulting, for example, pure Gothic, and the walls covered with Moorish patterns. The staircase is magnificent, from the floor to its splendid dome covered with the finest blue and green tiles, in Persian patterns. There are two stories of magnificent rooms. Other houses there are which retain one or two rooms intact from the Saracen period; but these two are the finest.

As for the churches, they are inexhaustible; and, besides the large number mentioned in the guides, one comes upon many others attached to convents which are little known, and with difficulty visited. The interesting ones are chiefly of two periods. Those in which, after the conquest of the Moors, the exquisite art of the vanquished was applied to Christian building, and the great churches built in the sixteenth and seventeenth centuries. The former style is called *Mudejar*, and, though not very homogeneous, has many very beautiful characteristics. Fine brick towers, with cusped Moorish arcading, magnificent open roofs, with inlaid wood-work, rich tiles, etc., distinguish them. They are built with one simple nave and apse, the towers standing semi-detached. The other set of churches have nave, transept, central dome, and apse. The exteriors of the central dome and of the two smaller domes or towers, rising from the façade, are covered with bright glazed tiles, and incrusted with brilliant azulejos, — generally blue or green. As if this were not bright enough, the architectural lines are often picked out by red paint! Nothing but the intense brilliancy of the sky, the white houses, and green trees which shade the many little squares, could save these buildings from hopeless vulgarity; but their bold proportions, with strong effects of light and shade, make them appropriate to the blaze of color about them. Within they show an equally deplorable taste, but a most extraordinary skill in conceiving and executing *baroque* ornaments. The high altars here rise to the vault of the apse in one mass of gilding. Small pieces of looking-glass are introduced among the confusion of details and statuettes, which make a hardly more distinguishable mass than the honeycomb vaults of the Moors. All this is barbaric; but by its very sumptuous richness, and the skill with which the end sought is attained, it cannot fail to excite wonder, if not admiration. The wrought iron, generally gilt and painted, is really fine, and the organ screens (as I have previously hinted) most effective.

SLOW-BURNING CONSTRUCTION.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — I fear that the discussion with C. may have come to a lame and impotent conclusion in respect to the remedy for admitted evils, for reasons to be given presently. First, however, let me explain one point. We are so accustomed to speak of lath and *plaster* that I may have used the latter word where I meant *lime mortar*. We should not advise putting plaster of Paris (gypsum) on either wood or iron.

By enclosing wood in plastering, I have intended to mean covering a beam on three sides with lath and *plastering*, and on the top with a water-tight floor, so that no air could reach the beam except through one or the other; and also without much regard to the contact of the mortar. In other words, we advise the least possible furring or air-space behind the mortar, and in many cases mortar has been put on with what we call "dove-tailed wooden lath" nailed to the timber or ceiling, like this  with no furring whatever, so that the mortar lies close to the wood.

We can designate many floors laid in mortar in Rhode Island that have stood over thirty years; many beams protected with mortar and many roofs with shingles laid in mortar. The latter method we often advise both for safety from fire and to promote the durability of the shingles.

In respect to the use of three-inch plank for floors, I am at a loss to understand how there would be a waste of material in matching; on the contrary, I should expect a saving as compared to tonguing and grooving boards, because both the planks would be grooved and a spline inserted to match them. There would be no loss like that in making a tongue.

In respect to the dampness of hollow walls, we cannot feel assured, as the condition of the factory differs so much from that of the city warehouse; but since this discussion began, one of the buildings which I have designated as dangerous has been on fire, and the fire passed from the second to the upper story on the back side of the plastering of a *party-wall* from which it was furred off; it is safe to say that the damage was one hundred-fold what it would have been had the building been constructed in the factory fashion as to the *party-wall* only. In this building, as in many others, there was an expense incurred in outside decoration that would have paid the cost of safer inside construction ten times over.

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alleges that the remedy may lie with the underwriters, and this ...ie. The mutual underwriters have applied the remedy with ...success, but it is useless to expect a remedy to come from the ...esent method of competitive underwriting under the stock system, for reasons that would take too much time and space to give.

Neither has the writer any great confidence in building acts or legislative interference. He must end as he began by saying that the money often expended in attempts to produce architectural effect in outside construction would have made buildings within his knowledge more fit for use and vastly safer if it had been in part devoted to better methods of inside construction.

All that is needed in the matter seems to be that *many* architects and builders shall be as well trained in the principles of slow-burning construction as a few of their number now are.

It can hardly be that the owners of property who are so willing to spend very large sums of money for architectural effect should be unwilling to consider the suggestions that may be made by architects for greater safety. I must still adhere to my belief that safety and economy can be as well combined in a city warehouse, school-house, or church as they have been in cotton factories; and as I know that this discussion has served as an incentive to several young students of architecture to study the factory problem, I hope you may soon have some designs for factories submitted to you that will meet these conditions and not be subject to the charge of "dreariness" in effect.

E. A.

PUBLICATION RECEIVED.

Hygiene and Public Health. A Treatise. Edited by Albert H. Buck, M. D., American Editor of Ziemssen's Cyclopædia of the Practice of Medicine; Instructor in Otology in the College of Physicians and Surgeons, New York; Aural Surgeon to the New York Eye and Ear Infirmary. Two vols. large octavo. New York: William Wood & Co. 1879.

NOTES OF EXPERIENCE AND INEXPERIENCE.

34. Stove. — Perhaps Subscriber can induce his client to use one of Musgrave's slow-burning stoves. It would be expensive, as it would probably be necessary to import one from England; but it would prove economical of coal and afford agreeable heat. Eds.

36. Inlay on Marble. — It is desired to fill in sunk letters on a white marble monument with some black cement that will take a polished surface and not be affected by exposure to the weather. Will some one recommend a material? R. B.

NOTES AND CLIPPINGS.

Protecting Theatres at Munich. — In connection with the various remarks on theatres in other parts of the paper, the following condensation of the theatre ordinance at Munich, which we copy from the *Fireman's Journal*, is of interest: Telegraph wires shall be fixed in the theatre building, to connect with the room in which the fire alarm apparatus is located. The proscenium, except its opening, shall be separated from the auditorium by reasonably thick and fire-proof walls. A metal curtain suspended from wire ropes shall close the opening of the proscenium, thus separating it from the auditorium, and shall only be raised during performances; great care shall be taken to have it at all times in suitable condition. The proscenium shall not be used as a store-room for scenery or other theatre articles, or the room above or below. No more scenery than is necessary for two scenes shall be placed in position. Exhibition of pyrotechny, rockets, etc., shall only be permitted when each piece of timber of the proscenium, and each article of decoration, has been rendered fire-proof. Wardrobes and green-rooms shall be located in such a position as not to interfere with the exit of the spectators, and the suspending of vestments in the passages is strictly forbidden. Should the ordinary doors be insufficient to afford a quick exit, others shall be provided and kept in readiness, and shall be marked to be such in large and plain letters; they shall, moreover, be closed only by a common bolt from the inside, easily reached and withdrawn by the hand. Store-rooms for decorations or any other articles shall not be situated within the auditorium, nor shall the lofts be used as such, but shall be kept in apartments separated by a wall from the theatre. The windows of green-rooms shall not have bars or net-work of iron; moreover, a sufficient amount of rope-ladders shall be provided and kept on hand, for immediate use, etc.

The Albert Memorial. — The late Sir George Gilbert Scott, architect, once said: "The Prince Consort Memorial (in Hyde Park) being my most prominent work, those who wish to traduce me will naturally select it for their attacks. I can only say that if this work is worthy of their contempt I am myself equally deserving of it, for it is the result of my highest and most enthusiastic efforts."

Electric Lighting from a Distance. — On the evening of July 12, the Maxim electric light was put in operation on the tower of the Grand Union Hotel, Saratoga Springs, N. Y., with a view to test the extent of its illuminating powers. An open parabolic reflector was used — no lenses — and care was taken by Mr. Maxim to set the points of the carbons a little at one side of each other, and to adjust them to the exact focus of the reflector. When this was fairly accomplished the light was turned toward a spot in Ballston Spa, New York, 7¼ miles distant, where, by previous arrangement, a group of several hundred persons were assembled to witness the experiment. So powerful was the light, so accurate the focusing and alignment, that the designated place in Ballston was instantly illuminated, so that ordinary print could be read, the time seen on watches, etc. The night was clear, still, and dark. The experiment was made at 9½ o'clock P. M. This is believed to be the greatest distance at which illumination of equal degree has been accomplished. — *Scientific American.*

Wesleyan *vs.* Churchman. — A cause of interest to antiquaries and architects was tried at the recent assizes at Leeds before Lord Justice Bramwell and a special jury. A report of the trial is given in the *Eastern Morning News* of August 7. The plaintiffs were Messrs. Botterill, architects, of Hull, and the defendant was the Rev. R. Y. Whytehead, of Nunkeeling. At a few miles from Hull is the church of Skirlaugh, which is well known as a valuable example of architecture from its style, and from its having been but little added to or altered, and from its being dated. It has been noticed and illustrated by Britton, Pugin, and other writers. Some parts of it, especially the elaborate parapet and pinnacles of the tower, have become decayed, and accordingly it was decided, about a year ago, to restore it. A committee was appointed, and Mr. Botterill was chosen to carry out the repairs. The defendant, who lives in the neighborhood, being informed that considerable repairs were contemplated, and that the proposed architect had little or no experience in that kind of work, wrote a memorial to the committee requesting them to take care that no unnecessary demolition should take place, and that "the work be placed in skilful and experienced hands." This memorial was sent to various societies and individuals, and after having received numerous signatures was duly forwarded to the committee. Besides this the defendant wrote a private letter to the chief donors to the restoration fund with the same object, and stating that Mr. Botterill was "a Wesleyan who could show no experience in Church work." He wrote another letter of similar import to the vicar, which letter had been destroyed, but the contents of it had been transcribed from memory and were taken as evidence. The plaintiff in consequence brought an action against the defendant for libel. The main charge of libel was founded by the counsel for the plaintiff on the words "is a Wesleyan." The defendant urged that the plaintiff had what might be called "no experience in Church work," and called several witnesses to prove that the drawings made for the restoration were inaccurately copied from the old work, that the course proposed to be pursued was not necessary or desirable, and that the building would in consequence suffer from the plaintiff's treatment. The jury found that the two letters were libellous but that the memorial was not so, and gave a verdict for the plaintiff with £50 damages. — *Academy.*

Vandalism. — A curious case of vandalism is reported from Madrid, where a priest who was summoned to shrive a dying man refused to grant him absolution until he had consented that two valuable paintings by Rubens, which the priest was pleased to consider immoral, should be burned. Upon what legal ground the heir of the deceased connoisseur has brought a suit against the priest for six thousand dollars is not stated, but it is little likely that in Catholic Spain the suit will go against the priest.

What Firemen say about Underwriting. — As to insurance tending to encourage the erection of cheap and unsubstantial buildings, the fact is so apparent that it needs no argument. Buildings, especially those designed for business purposes, are erected in the hope that they will prove a source of profit to the owner. A cheap and flimsy block, having a showy exterior and tawdry finish inside, will rent for quite as much as a building more substantially constructed and costing more money. If the owner had to take his own risk as to fire, he would make his building as nearly fire-proof as possible; but as the insurance companies, for a small premium, will insure the building for all, or even more, than it is worth, the owner naturally puts up the building that will be the most profitable and cost the least money. Hence we have those architectural abominations and fire-spreading agencies, mansard roofs, and modern structures wherein wood takes the place of brick or stone wherever possible. Insurance tends, also, to make property owners careless, and even reckless, as to their property, subjecting it to risks and hazardous exposures that they would not tolerate for a moment if they had to foot the bills in case of loss. In view of the facts in the matter, which are apparent to whoever looks for them, we repeat what we said before: It may well be questioned, then, as is now being done, whether fire insurance, as at present practised, is a blessing or a curse to the country. Properly managed, insurance is a great benefit, but of late the competition for business has been so great among the companies that it has certainly impaired, if it has not destroyed, their usefulness. — *The Fireman's Journal.*

Blackboard Paint. — The following is said to be a good recipe: One quart of shellac dissolved in alcohol, three ounces of pulverized pumice-stone, two ounces of pulverized rotten-stone, and four ounces of lampblack; mix the last three ingredients together, moisten a portion at a time with a little of the shellac and alcohol, grind as thoroughly as possible with a knife or spatula, after which pour in the remainder of the alcohol, stirring often to prevent settling. One quart will furnish two coats for eighty square feet of blackboard not previously painted. The preparation dries immediately, and the board may be used within an hour if necessary.

The Triptych of Quentin Matsys. — The Belgian government has at length succeeded in buying from the Church of St. Peter, at Louvain, the celebrated triptych of Quentin Matsys, and this early Flemish painting will henceforward be preserved in the museum at Brussels. The towns-people wished to keep the painting in the town and tried to buy it so that it might be placed in the town-hall. The price actually paid was about forty thousand dollars.

Mineral Wool. — It is said that during the last two years the Pennsylvania Railroad Company has used about 117,000 pounds of mineral wool for deadening floors of passenger cars, 10,000 pounds for covering water pipes, 6,000 pounds for covering boilers in shops, and 12,000 pounds of superior quality for covering boilers in ferry boats, steam-tugs, etc; the whole amount being enough, at an average thickness of two inches, to cover 32,000 square feet with a layer two inches thick.

Sunken Timber. — During the past summer a number of gangs of men have been employed in raising from the bed of the St. Lawrence, in the neighborhood of the Lachine Rapids, logs of white oak and black walnut which have sunk in consequence of the wrecking of drives and rafts during the last thirty or forty years. Some of the logs raised from the bottom of Longueville Bay are two feet in diameter and sixty feet long.

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WE have received the first three numbers of the *Quarterly Architectural Review*, published by Messrs. Wolfe & Burnham, architects, of San Francisco, California. This is a journal mainly of advertisements, not of essays and discussions, as its ambitious title seems to promise, circulated gratuitously at a cost to the original projectors, as stated in the July number, of eight hundred dollars for the first two numbers, while they have received, according to the same authority, not more than half that sum for advertising space. It is to be hoped, however, that the enterprising firm finds its reward in a due public appreciation of the merits and experience of Messrs. Wolfe & Burnham, which are set forth in the eight pages of reading matter in every number with a fullness and frankness which certainly merits recognition. They now are encouraged to issue monthly editions, to meet the increased expense of which they propose hereafter to furnish their journal to subscribers at a cost of $1.50 annually. The prospectus for this new departure embraces certainly a scheme of greater professional usefulness than is promised by the gratuitous numbers already issued. If the ideas of the prospectus are fulfilled in a proper spirit, and with as much of literary ability as the authors have already displayed of energy and self-confidence, the new journal can hardly fail to be an active agent in the civilization of the Pacific coast. The illustrations are very various in quality, and the designs, as might have been expected, largely partake of those peculiar characteristics of untutored invention applied to the conventional forms of architecture which constitute the true vernacular style. If this vernacular style is destined ever to develop and bear good fruit, we may look to the Pacific coast for its first manifestations of promise. Notwithstanding the illiterateness and awkwardness of these beginnings, they may be the foreshadowing of a new energy in architecture, to which perhaps we of the Eastern coast, who spend our time in refining and adapting the details of the historical styles of the Old World, may ultimately turn for the refreshment of new inspirations. The function of the most thoughtful architects in California with respect to this possible development is obvious enough, and the *Review*, if properly used by them, may be no inconsiderable agent in the work.

THIS enterprise of our Western brethren has our heartiest sympathy in its advocacy of the organization of a society of architects on the Pacific coast, and in its efforts to create a common cause and a public spirit among the architects of San Francisco, Oakland, San Jose, Sacramento, and the other new cities of California, to the end that they may better support one another and arrive at a more complete understanding of their duties to society. That such combination, mutual support, and instruction are sadly needed by the profession in those regions is plainly indicated by the tone of nearly all the articles in the *Review*. According to these the attitude of the public towards the profession is one of constant hostility and suspicion, and the journal is compelled to devote the greater part of its space to the sustaining of the architectural side, to the defence of the architect as opposed to the builder, and to the stout maintenance of propositions regarding sanitary construction which here have been long accepted by laymen and architects alike as the commonplaces of practice, though even they certainly cannot claim to have reached any formula of perfection in this matter. Perhaps it is to this strenuous atmosphere that is to be attributed somewhat of the advertising boastfulness and self-assertion with which the professional proprietors so copiously set forth their qualifications. Such a tone cannot subserve any good purpose; it is inconsistent with true self-respect and real knowledge, and, what is of more importance, with the promise of the prospectus of the monthly edition, which, if maintained discreetly, will unite the profession on the Pacific coast, will raise its standard of acquirements and conduct, and make it less like an advertising trade competing with builders, and more like an art which needs no apology or defence.

IN our larger cities it is now not unusual to see retail merchants, in emulation of their more modest brother, the country shopkeeper, extending their business so as to include merchandise of various kinds, having no essential relations one with another. This approximation to the idea of the Oriental bazaar is to be carried still farther by the enterprise of a company lately formed in the city of New York, with a capital of $100,000. It has leased from Mr. Vanderbilt, at an annual rental of $30,000, the square, measuring 425 by 200 feet, bounded by Fourth and Madison Avenues and Twenty-sixth and Twenty-seventh Streets, known as Madison Square Garden. It is the purpose of the company to occupy this space with what is known as "an arcade," after the fashion of the famous prototype at Milan, perhaps, but only in one story, to cover it with a continuous roof, and to divide it by passage-ways running lengthwise and across the building. The spaces thus made accessible for traffic are to be sub-leased to merchants and manufacturers in every branch of trade, who will erect booths, as at an exposition, with a view each to setting forth his goods to the greatest advantage. The company reserves to itself, of course, the privilege of discriminating among tenants, so as to secure the greatest variety of business, and to exclude objectionable traffic; it will also establish an express delivery and lunch department. This comprehensive arrangement will enable the visitor to do shopping on an extended scale with a minimum of inconvenience. If this undertaking is established on a firm foundation of success, there will apparently be opened to the modern architect still another opportunity of design such as none of his predecessors have ever enjoyed, and such as, together with markets, exhibition buildings, mills, railway stations, free public libraries, steam elevators, and churches, with their characteristic modern appliances of social parlors and class-rooms, will contribute its share towards the development of new forms in architecture. The temple, the basilica, the cathedral, the Renaissance palace, can hardly offer the remotest suggestion towards the fulfilment of such problems as these. They compel us to break loose from conventions, and to start, without the embarrassments of tradition, from considerations purely of convenience and structure.

DURING the last three or four years, the profession throughout the country has been amused, if not instructed and edified, by the surprising succession of mishaps and investigations which has marked the growth of the two important buildings in Chicago, the City-Hall and County Court-House and the United States Custom-House. No sooner has the last City-Hall investigation been closed by the substantial exoneration of all the parties whose conduct formed the object of the investigation, than the attention of the professional public is called to the Custom-House by a very noteworthy incident. Every one is familiar with the inexplicable and phenomenal differences which the opening of every batch of sealed proposals is sure to reveal, but even the most experienced practitioner will feel that he has not yet fathomed the mysteries of builders' mathematics, when he learns that the difference between the highest and lowest bids for the plastering — ordinary three-coat plastering, seemingly the simplest thing to make estimates on, the lathing, too, being let out in another contract — of the Custom-House was $42,573.55. The lowest bid, $16,426.45, was made by Mr. Joseph Eastman, of Chicago; and the highest bid, $59,000, was made by Messrs. Tobey & Smith, also of Chicago. The average of the sixteen bids submitted, the complete list of which is printed in our columns of building intelligence, is $34,187.33, and, if the lowest two bids are thrown out, the average would be

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not far from the $40,000 which, we are given to understand, would be a fair price for the work. This disparity may partly be accounted for by the cost of the greater or less labor and skill which the competitors proposed to expend on the cornices and other enrichments, of which there possibly may be a great deal. But even this cannot account for a difference of over forty thousand dollars.

Whether or not the fortunate or unfortunate Mr. Eastman is to be held to his bid, as he may be by virtue of that clause of the specification which declares that "the contractor is required to make his measurements from the drawings and the building, and be held responsible for any errors arising therefrom," it would be interesting to know what were the methods of computation employed by him and the Messrs. Tobey & Smith, which could produce such different results. We take it for granted that the bid is a *bonâ fide* bid, and that there is such a person as Joseph Eastman, since it is stated that proposals "will be considered only when received from parties who are practically engaged in this class of work;" although this clause did not, in a recent government competition, prevent the presentation of a bid for certain fixtures by a man who was not a manufacturer of or dealer in them, who, furthermore, submitted specimens of material which were shown to be superior to what he really intended to use. This mysterious affair at Chicago has its significance, since it shows in what an undignified position the Government places itself in consenting to become a party to a game of chance, in which it seemingly shows itself willing to victimize, or to acquiesce in being made a victim by, a contractor. If there are any buildings for which bills of quantities should be prepared, either by the architect or by a regular quantity surveyor, they are the government buildings, built with the public money, some little of which may be held to be properly used, if it guards the Government on the one hand from accepting a bid far in excess of the real value of the work, or from being imposed upon by work which will be scamped, in spite of all inspection. The Government should have some other aid in gauging the trustworthiness of the bids submitted than the approximative estimates which architects in private practice prepare for their own guidance. Indeed, it almost seems as if the only uncertain factor in the cost of a government building should be the amount of the contractor's profit.

The story which is told by a correspondent in another column at once shows how large a portion of responsibility for the present imperfect style of building in this country really lies with the fire-underwriters, and how necessary, in all our large cities, is the passage of a theatre act such as we published last week. Reforms come slowly, and we must be content if we advance at all. Some of the reforms which were made in compliance with the imperative demand of the public after the burning of the Brooklyn Theatre have been very real, as was shown in an inspection of the New York theatres by a reporter of the *Evening Post* in consequence of a slight fire on the stage of Niblo's Theatre, September 4, who found in the dozen leading theatres visited that all scenery was invariably painted in water-color on canvas prepared either with tungstate of soda or with a solution of alum. From this it seems that managers are willing to take certain precautions voluntarily, while the inspectors of the building departments are able to enforce certain others; and now that our correspondent E. A. admits that much of the blame does rest with the underwriters, we may hope that they may soon be induced to discriminate more wisely in favor of the better protected buildings. When once owners, architects, underwriters, and lawmakers have reached a common understanding of the duties they mutually owe the public, we may expect a steady improvement in our methods of building to date from that time.

Quite as much in need of reform as our methods of building is our system of scaffolding, as is shown by the numerous fatal accidents that have happened in the last week or two. The most serious of these was the fall of six bridge builders in Baltimore, who, working on a large plank, apparently unsecured to the floor girders of the bridge on which it rested, attempted to overturn a large iron girder, which weighed some fifteen hundred pounds. This, because of its shape, turned with unexpected suddenness, and their effort, being unresisted in one direction, was transferred to the plank on which they stood, so that it shot out behind them, and let them fall between it and the iron girder to the rocks, fifty feet below. Two were killed outright, and two others are not likely to live. The next accident, at East New York, on September 2, was caused, not so much by the common ignorance of strains and thrusts, as by the uncommon stupidity of the two men, who will probably answer with their lives for their folly, in using the half-burned timbers of the building they were to replace, in the scaffold they expected to work upon. The particulars of the scaffold accident at the opera-house in Leavenworth, Kansas, and the one at Covington, Kentucky, are not given in the daily papers.

Among the subjects which might engage the attention of students of architecture, in connection with such a technical museum as that we suggested three weeks ago, may be mentioned the trial of native building-stones, bricks, and terra-cotta, either by Brard's test or by the later form, in which actual freezing takes the place of the crystallization of sulphate of soda, with record of results; investigations of the causes and cure of white efflorescence on brickwork, and black stains on some varieties of Ohio freestone; experiments with the microscope on the power of chlorine, ozone, carbolic acid, or other disinfectants, to destroy minute organisms in the air; observations, with models at a large scale, on the flow of air and water currents through drain-pipes and traps, a subject on which little is yet understood; on adulterations, with the means of detecting them, in oils, varnishes, and paints; tests for soundness and seasoning in timber, for distinguishing sapling from mature wood, exhausted pitch-pine from virgin lumber; trials of the transverse strength of beams of Portland, Rosendale, selenitic, and other cements, which can be made at a small scale, and would be of vital importance to the extension of concrete construction; besides impartial examinations of patented materials which are thrust upon architects in every variety, and of every shade of merit. We remember being once visited by a vendor of "incombustible felting" for protecting roofs and other wood-work from the flames in case of fire. The "fire-proof felt" had the appearance of being made of woollen rags; but supposing that it might have been treated with alum or alkaline silicate in some new and interesting manner, we lighted the gas and held the *soi-disant* incombustible material over it, whereupon it took fire and burned up. The agent looked on with apparent surprise, but departed without attempting to explain the phenomenon. From impositions of this kind, well-conducted experiments would be a great safeguard, and there are many other articles of manufacture of more or less value, such, for instance, as the "asbestos," "chemical," and other mixed paints, of which architects would be very glad to have a trustworthy and thorough criticism. Such criticism, under the prestige of a State technical school, would be courted by the manufacturers of really valuable articles, and it would cause us no regret if materials of a different kind were to be driven from the market by fear of it.

THE WASHINGTON MONUMENT.

The ugliest monument in the world is in a fair way to be completed, — not according to the original plans, for not only has every vestige of them disappeared, but the design as we know it from tradition is to be despoiled of what proportion and dignity it once had by omitting a hundred feet of its height and the whole of the imposing colonnade which was to surround its base.

By whose authority these somewhat important modifications of the conception of Robert Mills are made, we do not know, and indeed, those who have ventured to suggest what they considered improvements on the original scheme have been so roughly handled by the officers of the Monument Association that it seems only prudent for the promoters of this monstrous mutilation of a design which, in the language of the Secretary, has been so "fully approved by the people" that they "will not tolerate any attempt to abandon it," to keep themselves concealed. So sure is the Secretary that "the people" demand the immediate completion of the monument in some shape, however mangled, that he objects to any attempts even to strengthen the foundation, claiming that as the earth has supported the present structure, which weighs 32,000 tons, for twenty years, there is no reason to fear that it will not support indefinitely the completed building, which, even in the form now proposed, will weigh 54,000 tons, and protesting against "any sanction by the Executive of the impression that the foundation is insufficient."

Fortunately, those to whom the matter was intrusted did not think that the "sanction of the Executive" was sufficient to hold up a tower five hundred feet high without at least a reasonable degree of coöperation on the part of the foundation on which the structure stood, and a thorough survey of the monument has been made, a plan for strengthening it adopted, and a considerable amount of work

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executed in accordance with the plan, the connected history of which is quite interesting.

After considerable discussion, as will be remembered, by Act of Congress approved August 2, 1876, a Joint Commission for the Completion of the Washington Monument was created, consisting of President Hayes, Mr. W. W. Corcoran, General A. A. Humphreys, Chief of Engineers, U. S. A., and Messrs. Edward Clark and J. G. Hill, the former architect of the Capitol Extension, and the latter Supervising Architect of the Treasury Department. Under their direction, a board of engineer officers was appointed, consisting of Col. J. D. Kurtz, and Generals Duane and Gilmore, who caused a scientific inspection of the foundation in its present state to be made.

On testing the ground upon which the monument stands, taking specimens from different depths, it was found to consist of sand and clay, the clay varying from one third to two thirds of the whole, but the proportion being everywhere greater than that which would just suffice to fill the voids of the sand, and the mixture being therefore compressible to a greater or less degree throughout. The site is near the river bank, and but little above it, and the ground is therefore constantly wet. Not far from the water level, twenty-two feet below the present surface of the ground, the soil changes to a hardpan of gravel mixed with boulders. Enclosing prisms of the soil in strong boxes and submitting them to the action of a hydraulic press, it was found that they were shortened more than two per cent by a pressure of seven tons to the square foot, which was about that which the ground would have to bear at the completion of the structure. This experiment indicated the probability of settlement by simple compression of the soil, independent of the further movement from lateral escape of the soft ground from under the load, which is generally to be looked for in such cases; and these considerations, joined to a comparison of the actual weights borne by similar soils under other structures, led the Board to the conclusion that the present pressure of the monument on the underlying earth, five tons per square foot, was as much as it could be expected to bear, and that the completion, even to the greatly reduced height of four hundred feet, would bring a load upon it which no similar soil had ever been known to bear safely. This was in perfect accord with the report made three years before to a committee of the House of Representatives by the Board of Engineers for Fortifications, consisting of Generals Barnard, Tower, and Wright.

The natural inference from the ascertained compressibility of the ground was that the monument would have already sunk slightly since the suspension of operations on it. In the hope of obtaining indications on this point, the Board tried to discover some benchmark which might have been used for levels, and misunderstanding the directions given them by the Monument Association, they came upon a stone nearly corresponding to a bench, of which there was a record in the archives of the Association. Levelling from this, they ascertained that the whole structure had settled eight and one half inches into the ground. On the announcement of this discovery, the Monument Association, who seemed to consider any suggestion of settlement in the building as an aspersion on themselves, published a long review of the report of the Board, showing that the stone which had, on their information, been taken for a bench, had really nothing to do with the monument, and that there was no existing mark from which the fact of settlement could be ascertained.

This, however, did not prove, as they thought it did, that there had been no movement, but only that the amount of the movement, if any, could never be known, and the Joint Commission, preferring to trust the conclusions drawn from actual experiment and the history of similar structures, rather than the opinions quoted to them of "thousands of visitors," who have expressed themselves "perfectly satisfied of the strength of the foundation to sustain any weight which could be placed upon it," or of the "distinguished architects" and "practical men" who "declared that it could not be better," began to consider plans for enlarging the area of the footings, or confining the earth under them, so as to insure the stability of the building.

The cheapest device seemed to be a wall of concrete or masonry, enclosing the ground below the footings, to prevent its lateral escape. The Board suggested a circular wall of concrete, tied with iron bands, while an engineer member of the Monument Association proposed to build a quadrangular wall of brick and concrete, with curved sides, forming arches having their extrados toward the centre. The cost of this would be, according to the plan of the Board, $39,300, and according to Mr. Stuart's plan $36,000, and the additional security thus gained would, it was thought, enable the shaft to be carried up, with thin walls, to a height of four hundred feet.

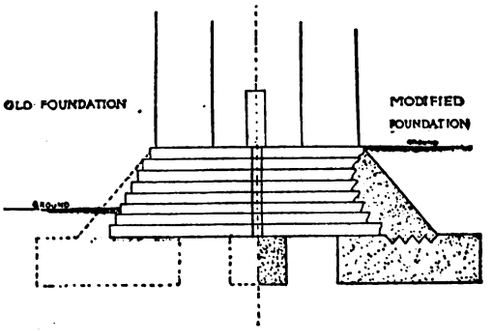
The more costly alternative presented by the Board was to tunnel under the footings of the monument and underpin with concrete to a depth of fifteen feet, extending the area of the concrete slab to about nine thousand square feet.

What reception these propositions met with does not appear, but the Commission, which seems to have brought enthusiasm as well as prudence to its work, finally resolved on a more ambitious scheme, for in June, 1878, we find Lieutenant-Colonel T. L. Casey, of the Corps of Engineers, U. S. A., directed by special order to report to the Commission as engineer in charge of the construction of the monument, and required to prepare a project for carrying the shaft, which by its rapid mutations in length begins to remind one of Jack's bean-stalk, to a height of at least 525 feet.

As a preliminary to this undertaking, Colonel Casey made a new examination of the entire structure. The shaft he found to be faced with white marble, in courses of two feet rise, fourteen to eighteen inches thick, with a certain proportion of headers about six feet in the wall, but with no attempt to obtain a regular bond. The backing was of bluestone rubble, laid in mortar which appeared to have some cement in it. The workmanship of the ashlar was bad, the joints and beds only extending a few inches from the face, and the stone then tapering irregularly. The vacancies were filled with chips, but the greater settlement of the backing had thrown the pressure on the facing blocks, nearly all of which, in the lower portions, were cracked or "flushed" at the joints from this cause. To obviate the further crushing which would ensue from loading the part already built with the weight of the superstructure, he recommended to cut back all the horizontal joints of the lower portion, pointing up at some future time, when the whole work should have completely settled. The shaft, as it would be constructed, Colonel Casey proposed to divide into three portions: the first consisting of the 156 feet already built; the second to be 172 feet high, faced with ashlar, the stretchers two feet on the bed, and the headers to run through the wall, which would vary from eight and a half to five feet thick, and would be backed with coursed rubble; and the third to comprise the remainder of the stone-work, to a height of five hundred feet, which would be of solid marble blocks, the wall varying in thickness from five feet at the bottom to eighteen inches at the top. The remaining twenty-five feet, in Colonel Casey's proposition, was to consist of a pyramidal roof of iron and glass. The interior angles of the new structure would be rounded, thus giving strength at the corners, and iron cramps and stiffening beams would be built in wherever needed. The weight of the masonry of the present shaft was found to be 164.88 pounds per cubic foot, and the total weight of the incomplete shaft, foundation, and the earth on the foundation, amounted to 32,176 tons of 2,240 pounds. Why the ton of 2,240 pounds should here be used is, by the way, an unsolved question. In the reports of most of the other experts the ton of 2,000 pounds is the standard, and one gives results in terms of the "American ton," whatever that may be. Nothing is more annoying than such uncertainties in tabulating results which will serve for reference to engineers and architects for centuries, and it is to be hoped that before any more such important documents are issued, a conference between the high authorities may agree either upon a metric notation or an official ton, which shall not need to be accompanied with explanations.

The area of the present foundation, which Colonel Casey found to be of rubble of blue gneiss, laid in lime mortar without any trace of cement, was, at the bottom, 6,400 square feet, making the present pressure 5.027 tons per square foot on the earth beneath it. The total weight of the monument, exclusive of new foundation, completed as he proposed, would be 54,093 tons, giving 8.452 tons per square foot, and with the usual allowance for wind-pressure this might be increased on certain points to 9.941 tons. These, as Colonel Casey says, are far greater pressures than such soil has ever been known to sustain, and it seemed to him necessary to underpin and spread the foundation itself, instead of attempting to enclose the earth beneath it, as might be sufficient for a shorter shaft.

This he proposed to do, in brief, by inserting beneath it a mass of concrete in the form of a hollow square, 126½ feet each way outside, and leaving a vacancy 45 feet square inside. The concrete was to be introduced by tunnelling under the foundation, so that the earth now occupying the middle portion of the space beneath the present footings would not be disturbed, except that it was also proposed to excavate a circular space under the middle of the shaft, which could be reached through the existing well left in the middle of the old foundation. The concrete was to be 12⅓ feet in thickness, and the



outer line to be 23¼ feet beyond the outside line of the present footings. The mass extended 18 feet under the present foundation, the inner edge being 5 feet inside of the ashlar line of the foot of the shaft. To unite the present foundations with the new concrete footing, buttresses of concrete were proposed at intervals. The whole area enclosed by the perimeter of the concrete mass was 16,002 square feet, and the weight of the whole structure, as proposed, 80,378 tons; giving a pressure, even with allowance for wind, of only 5.398 tons per square foot of the earth beneath. As was shown by the former trials, the earth at the depth reached by the new concrete footing was far more solid than that nearer the surface, and in con-

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sideration of this, as well as of the important fact that, when terraced as proposed, the new bed of the foundation would be 35⅔ feet below the surface, Colonel Casey felt justified in regarding the scheme as a satisfactory solution of the problem proposed to him.

The cost of the new foundation and the buttressing was estimated at $99,102. When the work should be done, Colonel Casey advised that a weight equal to that of the actual portion of the monument which remained to be built, some 20,000 tons, should be piled upon the foundation, and the effect carefully observed.

On the first of October last, the engineer in charge received the orders of the Joint Commission to commence the work of strengthening the foundation in accordance with the plan submitted, and operations have been since steadily continued. Some modifications were made in the original scheme; the depth of the slab of concrete was increased to 13½ feet, and it was decided to make the buttressing continuous instead of limiting it to the partial props on each side. So far, the work has gone on most successfully. At the present time, August, about two thirds of the concrete underpinning has been put in place, without accident of any kind. The trenches, or rather tunnels, were driven in pairs, on opposite sides of the foundation, so that any settlement caused by the compressed earth under the footings escaping into the excavation might be alike on the two sides. The trenches were four feet wide, and large stones were built in, projecting from the side, as dowels to secure the adjoining slices of concrete.

At first the excavation caused perceptible settlement, the greatest effect amounting to 1.96 inches at the southeast corner, and the least 1.46 inches at the northwest corner. The monument had at the start an inclination toward the northwest, and the excavation was purposely managed so as to cause the greatest sinking at the opposite quarter. As the number of concrete walls increased, the settlement caused by driving each tunnel diminished, and latterly it has been almost nothing. The concrete is all made of Portland cement one part, sand two parts, pebbles three parts, and broken stone four parts, all mixed by machinery. The buttressing has not yet been commenced.

The original engineering difficulties of so simple a structure as the monument, even if carried to the height of six hundred feet as originally intended, are, with proper care, not very formidable; nothing, indeed, compared with such a problem as the balancing of Salisbury spire, 404 feet high, on the top of four lofty columns, so as to stand secure for seven hundred years, or the buttressing of the double dome of Santa Maria del Fiore; but to amend and supplement the work of constructors whose only idea of the foundation of such a building seems to have been that it should go "below frost," is a different undertaking, and one of which every step will be watched with interest.

In discussing the scheme for completion of the monument, the strongest feeling which we experience is the hope that the parsimony and ignorance which showed itself at the commencement of the work, thirty years ago, in abuse of those people who "wanted to have all the contributions on hand buried beneath the surface," instead of "carrying the work along under the banner of the people," will not make its appearance again. The Americans have gained the reputation of doing some things well: if the "popular will" demands the erection of a clumsy chimney to the memory of Washington, let this generation, for its own credit, try to have it so built that it will not fall down. A thorough and ample foundation alone, if the money will go no further, is a respectable and even interesting object, but a cracked and tottering pile, betraying at every moment the thinness of wall, the slighted workmanship and insufficient foundation which a cloud of "Executive sanctions" and bursts of eloquence strive in vain to conceal, is an object which could only bring upon us laughter and contempt.

Colonel Casey's scheme, admirably scientific and thorough as it is, still, to the expert, shows signs of the urgency with which the need of economy was pressed upon him. His formula for concrete, for instance, is made up with perfect knowledge of his materials, so as to secure the utmost strength which can be obtained with the given proportion of cement, which is the costly ingredient, but it certainly seems unfortunate that the quantity of cement should need to be restricted to one part in ten of the mixture. It is to be regretted also that the concrete mass should not extend under the whole of the foundation, instead of forming simply a hollow square. The pressure which will be brought upon the ground beneath, more than five tons to the square foot, supposing the distribution perfectly equal, is the utmost that it should be called upon to bear, and is nearly double the load that Rankine considers safe upon a *concrete* substratum. There is therefore no strength to spare, in case any part of the foundation should be unable to bear its share of the burden, and the failure of the enclosed square of earth to present as much resistance as the concrete would compel the latter to assume a double load, increasing the strain perhaps to a dangerous extent. It would seem that the prism of earth, which is almost a brick clay, might in the course of years, by the varying amount of moisture which will be contained in it as the neighboring Potomac rises and falls, undergo a swelling and shrinking, imperceptible at first, but capable in the course of years of producing serious results. The expansion of the clayey mass would compel it, as it could not lift the monument, to compress or penetrate the earth below, and on the retreat of the water this effect could not be recovered, but the shrinking of the prism must necessarily withdraw it from the stone-work above. Such an action takes place around pile foundations, and it seems by no means improbable in this case. If then the weight should by degrees be thrown entirely, or nearly so, upon the hollow square of concrete, how would that be affected?

The proposed buttressing is very skilfully applied so as not only to unite its action with that of the footings, but to carry even more than its share of the weight out to the centre of the concrete footing slab, thus applying the vertical load nearly in the line of the upward pressure or reaction of the earth, which is virtually applied at the centre of the under side of the slab, at B, in Figure 2. If the rubble foundation were as incompressible as the concrete buttress, the point of application of the downward pressure would be at A, in the centre of the portion of the slab which the superstructure covers, instead of at X, which is somewhere near the actual point, and the opposing forces acting at the ends of the lever A B would form a couple of enormous force, tending to turn the slab in the direction shown by the dotted line.

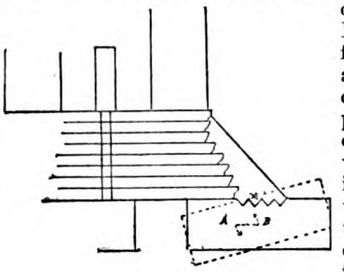


Figure 2.

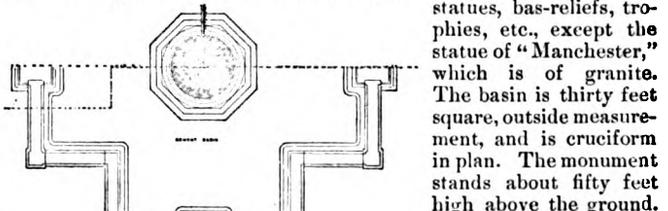
The size of the footing slab was prescribed by the area of earth over which it was necessary to distribute the load, and this device for taking advantage of the known indefinite compressibility of rubble masonry in lime mortar to carry out the pressure, by an incompressible concrete strut, to the proper point of application is as bold as it is scientific.

A piece of construction so delicate requires, however, to be executed with materials which can be thoroughly relied upon. The oblique action of the buttresses, opposed to the vertical resistance of the earth, will leave a resultant outward pressure which will severely try the tensile strength of the concrete, as well as its resistance to crushing, and no misplaced economy should be allowed to rob the material, all whose powers are thus so skilfully brought into action, of the degree of strength which shall not only be sufficient for the work, but shall leave ample security against the contingencies of earthquake shocks, winter freshets, and the various accidents which try high buildings far more than others. The modifications which Colonel Casey has already introduced in the execution of his plan, by increasing the transverse strength of his concrete footing, and substituting a continuous for an interrupted buttress, show that he has himself felt the need of increasing the margin of safety in the essential parts of the scheme, and the expenditure of a much larger sum in adding to the strength of the remainder of the work would not deprive his plan of the deserved credit of combining efficiency with economy in an admirable manner, nor will any thinking and patriotic American wish to have the money needful for such a purpose withheld.

THE ILLUSTRATIONS.

THE SOLDIERS' MONUMENT, MANCHESTER, N. H. MR. GEORGE KELLER, ARCHITECT, HARTFORD, CONN.

The design for this monument, which was dedicated September 11, was submitted in answer to an advertisement that appeared in the *American Architect* about two and a half years ago. The material is Concord granite for the structural portions, and bronze for the statues, bas-reliefs, trophies, etc., except the statue of "Manchester," which is of granite. The basin is thirty feet square, outside measurement, and is cruciform in plan. The monument stands about fifty feet high above the ground. The four statues surrounding the monument are six feet eight inches high, and the figure of "Manchester," eight feet high. The statues of the cavalryman, the artilleryman, and Manchester are the work of Mr. C. Buberl, the sailor and infantryman being designed by Mr. W. D. Richards, and the bas-reliefs by Mr. J. T. Hartley. Messrs. Ellin & Kitson did the architectural



carving. All casting was done by the National Fine Art Foundry. Special pains have been taken to insure a permanent and sub-

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Heliotypè Printing Co. *220 Devonshire St., Boston.*

SOLDIERS' MONUMENT AT MANCHESTER, N. H.

MR. GEORGE KELLER, ARCHITECT, HARTFORD, CONN.

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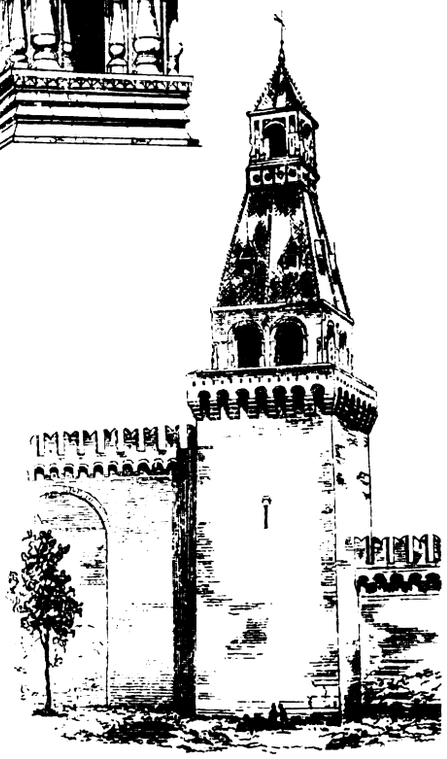

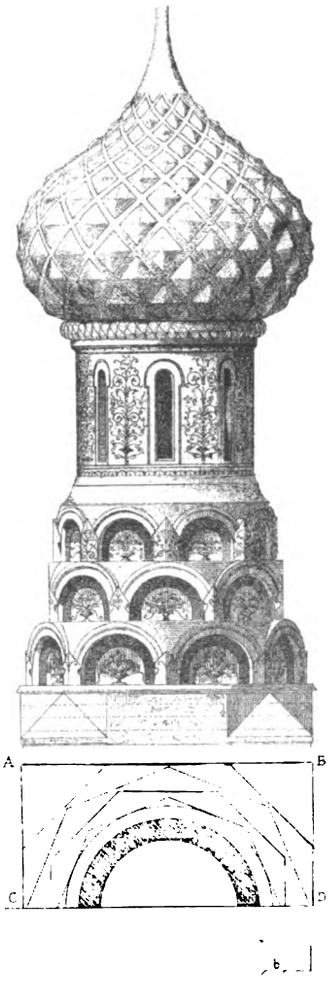

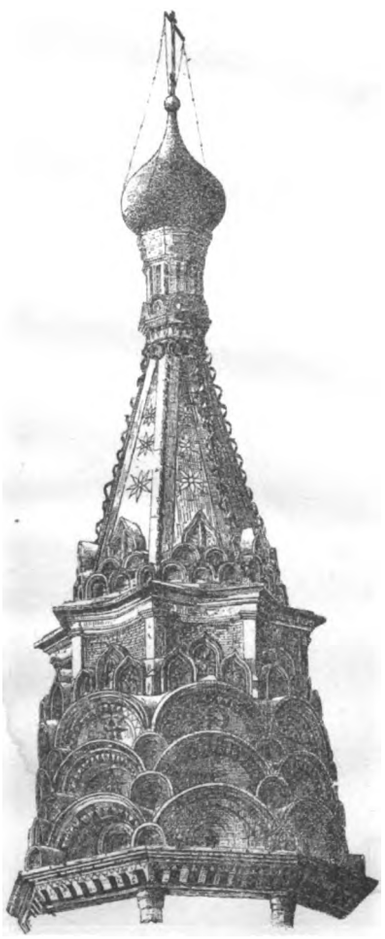

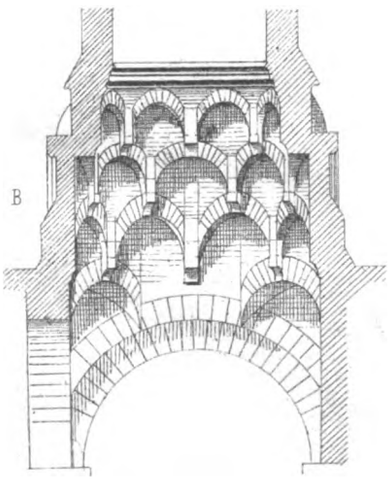

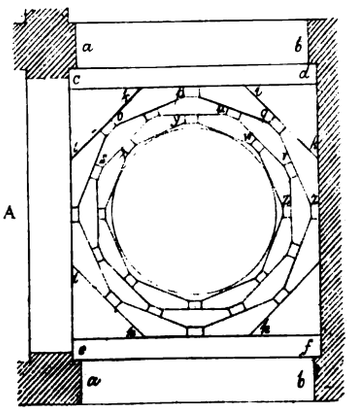

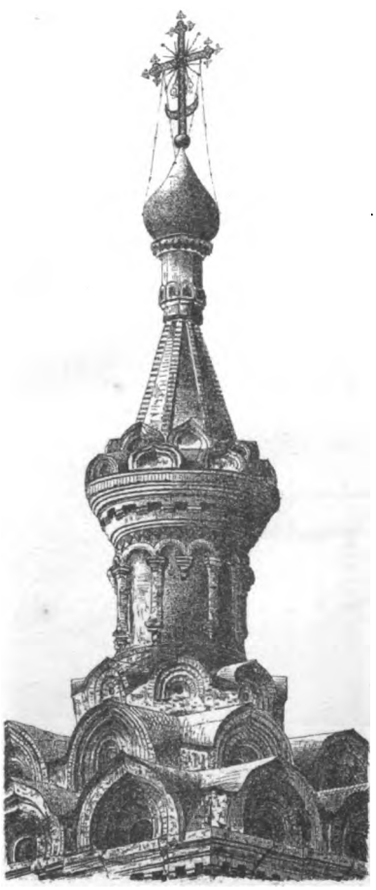

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

A GROUP OF RUSSIAN SPIRES.
FROM THE ZODTCHY.

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THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON.

BOYS LODGING HOUSE AND SCHOOLS — EAST BROADWAY — N.Y.
NOW BEING ERECTED — FOR THE CHILDRENS AID SOCIETY — BY MISS WOLFE

VAUX & RADFORD, ARCHITECTS. 1879.

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stantial construction for basin and foundation of the monument. The foundation is of concrete composed of Saylor's Portland cement, sand, and broken stone, small enough to pass through a one and a quarter diameter ring. The lowest course is of coarse concrete; the next is finer, and the finishing course still finer. The proportion of cement, sand, and broken stone, in volume, are given on the cuts, and were recommended by Captain Maclay, engineer in charge of works of "Department of Docks," New York.

EXAMPLES OF RUSSIAN SPIRES AND TOWERS.

These illustrations are reproduced from the pages of our Russian contemporary, the *Zodtchy*.

NEWSBOYS' LODGING-HOUSE, NEW YORK, N. Y. MESSRS. VAUX & RADFORD, ARCHITECTS, NEW YORK.

This building, which is to cost about $40,000, is a free gift to the Children's Aid Society on the part of Miss Wolfe. It is to be built of common hard brick with Peerless brick strings, etc.

CORRESPONDENCE.

THE CONNECTICUT THEOLOGICAL INSTITUTE AND ITS ARCHITECT. — CHRIST CHURCH. — THE FIRST REGIMENT'S ARMORY.

HARTFORD, CONN.

THAT the progress of architectural schemes is sometimes like the course of true love, which does not "run smooth," is illustrated by the exceptional action of the building committee of the Connecticut Theological Institute in relation to the professional services of their retained architect. In the spring of 1878, Mr. F. H. Kimball was employed to prepare plans for the institute, which were to embrace a main building with extensive wings, and so arranged that additions could be built as the demands of the institute required. A gymnasium, in a detached structure, was also designed. Much delay was occasioned by the absence of members of the committee whose views regarding the interior arrangement of the buildings must be considered, and under these circumstances the completion of the plans was deferred. Early in the fall the gymnasium was built; and, the work being in the hands of a builder who boasts that he gets rid of the "architect" as soon as the plans are finished, the appearance of the structure was marred, and the drawings were not followed, under the builder's pretence that he was "saving money" for the committee by carrying out his own ideas. A deaf ear was turned to the architect; and the builder, having thus succeeded in spoiling one building, thirsted for more. It was stipulated that the institute should cost, complete, a specified sum, and at the same time the accommodations called for were large. It was further desired by a leading member of the committee, who had devoted the best energies of his life to printing, and was therefore *au fait* on architectural matters, that the building should be plain, and should have no "improper" ornamentation. The privilege of putting the work into the market, and obtaining reliable estimates from several contractors, was not granted the architect; and the cost of the structure was computed by the invaluable builder, who was unable to take off his own quantities, and by one mason who was able! The result showed the cost in excess of the sum originally specified, and the plans were modified by the architect, who was restricted as before. In the late fall the building was laid out according to the plans, and the work, to be done by the day, was put into the hands of the parties who estimated.

Principally upon the grounds of excessive cost, the building committee, in the spring of 1879, relieved the architect of his position; and the builder, with plans and details altered so as to be unrecognizable, has pushed the work until it now approaches completion. It is rumored that he has been assisted by a New York architect; but to what portion of the indiscriminate slaughter of a good design this architect has contributed is not wholly apparent, so much of the "builder" class of treatment is conspicuous. The general features of the institute, as described in a former letter, have been maintained, and the distribution of the masses is the same; while upon the foundation has been erected a building which far from graces its fine location, and is a caricature of the merest approach to architecture. But this grand triumph of economy and ugliness over so-called prodigality and beauty pales before the fact that estimates were afterwards obtained guaranteeing the erection of the building according to the architect's modified plans for some $14,000 less than the figures submitted to the committee for the same work by the present builders. These estimates were obtained by the architect for his own satisfaction, and were accompanied by sufficient security bonds in each instance. In the original design for the institute the effect of the exterior was enhanced, at no fabulous outlay, by the introduction of much moulded and ornamental brickwork; and the principal windows were turned with full, round arches, displaying moulded work advantageously. The windows are now built with square heads, the caps making a melancholy show of ornamentation by means of incised work (which it is presumed is eminently "proper"). The ornamental brick have been left out of the building, and, in place of the brick and stone dormers, the roof — changed from the original — is equipped with wooden ones devoid of design, and in their baldness and poverty of treatment but keeping pace with the timid buttresses, the feeble cornice, and other features now attracting the public eye. Altogether the affair is the most unprofessional on record here; and that the course taken should have been allowed is a matter of wonder, in view of the fact that some members of the committee were gentlemen of unquestioned business capacity and able judgment.

The building in the rear of Christ Church which is now being erected from plans by Mr. Withers, of New York, is progressing rapidly. It measures about 40 by 60 feet, and is connected directly with the church. It will be two stories in height, except that portion directly back of the chancel. The walls are of rock-faced ashlar of Portland stone, with a finish of the same stone tooled. The north façade is diversified by a square bay, which is carried up two stories, and crowned with a high, pitched roof. On the east is a gable with tracery windows and shields for inscription. The walls are pierced by square-headed windows with stone mullions and transoms; gargoyles spring from the eaves of the bay, and moulded courses and carved work enrich the façades, at objective points. The main entrance upon Church Street gives access to a wide hall, from which on the right and left open respectively the rector's study and the vestry room, — well proportioned, lighted, ventilated, and adapted to their special requirements. The second entrance, which is on the west, is chiefly for the use of the Sunday-school, the room being on the left. It is 24 by 50 feet, and is built with exposed trusses, which (like the finish of the room) are of oak. A staircase in the main hall leads to the first floor, which contains one large room for parish work. It is 24 by 40, and will be finished in ash in its natural color. A robing-room opens from the new chancel on the left, and beneath is a library, connected by stairs with the Sunday-school room. The rear wall of the church will be in part removed to admit the chancel arch, which will be cut in stone. The chancel will be handsomely tiled, and a stained-glass window will be placed in the rear wall. The entire work will be completed before next Christmas.

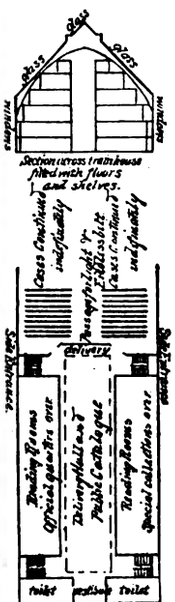
Another important building now being carried on is the armory for the First Regiment, opposite Bushnell Park. It includes the old skating rink, with extensive additions upon the front and rear, the work being executed from plans by Mr. Keller. The drill-room will be 79 by 184 feet, the company rooms opening into it at the same level, from the north and south. The new addition affords, beside the company rooms, accommodations for the colonel and adjutant, a squad drill-room 32 feet by 36, a band-room, and a gallery for visitors. A rifle range will also be built upon one side of the armory, 10 by 220 feet. The main building on the front is three stories in height, with an ample entrance midway in the front, which is 80 feet wide. A central tower is carried up about 70 feet. The building is of brick, laid in red mortar, with a finish in Ohio-stone, relieved by bands of diaper brick; moulded brick being largely used for jambs and arches of windows, and black brick is introduced in ornamental courses. The alterations, when complete, will cost in the neighborhood of $20,000; and the armory will be ready for occupancy in October.

CHETWOOD.

LIBRARY BUILDINGS.

AT the conference of librarians lately held in Boston, Professor Justin Winsor, Librarian of Harvard University and President of the Association, declared as follows his appreciation of the essential points of a library building, in words which we find reported in the *Library Journal*: —

"I had occasion to address a club of gentlemen the past winter, and exercising a librarian's prerogatives, I talked of the shop, and told them that of all the buildings in the United States, fitted to hold conveniently a very large library, that which, in my judgment, was the typical one, was owned by the Boston and Providence Railroad Corporation, — their admirable station in this city. That building is built a little irregularly to conform to the ground; but taking it in its broad indications, I sketch it thus: —



"The main body or head house, over 200 feet long, I would convert into the public and official working quarters of the library; this is two stories high, the lower one lofty. What is now the main waiting hall, lighted by a lanterned roof, would serve for the grand delivery room. On either side are reading-rooms, large and small, to be fitted up in detail as required. Over these, the official quarters and work-rooms, all opening on a balcony (indicated by the dotted line) which overlooks the grand hall and communicates with the stack-room or train-house. This last extension, of which you see the section, and which may be continued indefinitely, is, as built, about 600 feet long and 130 feet wide, external dimensions. I would leave a 30 foot passage down the middle, open to the roof, for light and for running the endless belts, which are to be kept in constant motion by hydraulic power, carrying boxes into which the books are put by pages on the different floors, these boxes inclining automatically, and delivering the books into cushioned receptacles near the desk, where the attendants take them and serve them over the counter. The books are called by numbers, a key-board at the counter working an annunciator, which gives the information to the pages waiting on the various levels. The transverse cases to be two feet eight inches apart, eight feet high; the floors to be glass; the side-walls to be as much of glass as possible, and also the roof. Tables to be placed between the lateral walls and the ends of the cases, for convenience of work at the shelves.

"A stack-room of the size of the present train-house could be made to hold, conveniently, near four millions of volumes, all, by means of mechanical appliances, practically close adjacent to the points of delivery. The building cost

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$800,000, and might cost something more, converted to this purpose. That building round the corner which holds the public library of Boston cost half as much, and holds an eighth part of the books, and inconveniently at that. The new building of the Ridgeway Branch in Philadelphia cost, I believe, nearly as much as this Providence station, and will hold one tenth of the books.

"I throw out what I have said simply as a guiding idea, to indicate what I hope will be the conditions under which a librarian may be called upon to administer large libraries in the future. The same principles adapted to narrower conditions of purse and more contracted limits of books, of every degree downward, may still obtain advantageously, as I believe, in the planning of all library structures, where there is to be large use by many people not known to the librarian."

Mr. Henry Van Brunt, of Ware & Van Brunt, Boston, the architects of the extension of the Harvard University Library, was called upon by the President, and responded more briefly than the Conference desired. By special request he has written out his opinions more fully, as follows: —

"I conceive that I shall make the most acceptable use of the opportunity afforded by your invitation if I base what I have to say less upon speculation than upon professional experience, which certainly is the safest, if not the most picturesque and interesting stand-point from which to view a practical question like this.

"The architect, when called upon to study this subject, cannot but recognize at the outset that there is involved in it one point of construction and design paramount to all others, viz.: how to provide accommodation for a great accumulation of books in such a manner that the utmost compactness of storage shall be made consistent with the most convenient classification, with accessibility, equality of temperature, abundance of light, complete security from dampness and from fire, and with provisions for the indefinite enlargement of the collection in any department without unnecessary waste of space. To meet these difficult requirements with due economy of construction and with a respectful independence of the traditions of architectural style, but with a proper regard for the essential qualities of architectural expression, there is made upon the resources of invention, of planning and constructing, a demand far more exacting than is felt in providing for any other department of the building. For to secure proper facilities for the administration of the library, with all its subordinate services of distribution and delivery, of cataloguing, bibliography, etc., to provide reading-rooms for the public and studies for scholars, galleries for books of reference and special collections, all this of course complicates the question more or less, but requires from the architect no very unusual effort of design.

"It is probable that the part of the problem which is concerned with the storage or stacking of the books never yet met with a perfectly satisfactory solution. I believe the provisions made in the British Museum, and by the accomplished M. Labrouste in his late additions to the National Library at Paris, are necessarily adapted to the accommodation of certain existing conditions of service, or traditions of practice in those monumental collections. For our own use these precedents can afford useful hints indeed, but the purposes for which mainly our own public libraries are established are new to the world of literature and books, and materially affect the question under consideration. For the continued rapid and prompt delivery of books in all departments, and the corresponding return of them to their proper shelves without confusion, as required in libraries established for popular use, imply an especial need for arrangements securing the greatest accessibility of the books and for mechanical appliances for their transmission, both horizontally and vertically. We have to provide also for accessions much more rapid than has been customary hitherto, and for frequent enlargement of special departments by gift and bequest. It may be fairly assumed that these new conditions are a continual inspiration for new contrivances of accommodation, varying according to local requirements and means, and, in the aggregate, showing a natural advance towards perfection through experience. It has been suggested to-day that the ideal library can only be realized by forgetting all these results of experience and by beginning anew, as all that has been done is fundamentally erroneous. Obviously, such a method of progression, if not unscientific, would be wasteful in the extreme. Doubtless we made a false start by endeavoring to adapt our large public collections to the traditional architectural library halls surrounded by chapel-like alcoves in several open stories (an arrangement excellent for small and for social libraries), but examples are not wanting in more recent structures wherein there has been exhibited an absolute freedom from such embarrassing precedents as this, and a direct development of form and structure from necessity.

"Among these I venture to refer you to the new wing of Gore Hall, the Library of Harvard University, which I understand you are to visit this afternoon. I refer to this, not because it is a perfect adaptation of means to ends, but because it marks a distinct intention of progress towards such a result, and because I am in part responsible for it, and for that reason better fitted perhaps to explain as an architect the conditions under which it was developed. In this construction the architects had the advantage of constant coöperation and advice from the authorities of the university, and were enabled thus to work, through experience, directly towards a practical end.

"The old library is a structure of granite, fashioned somewhat in the form of a chapel in the English Gothic of the fourteenth century, as this style was imperfectly understood some fifty years ago. It is about 85 feet long and 45 feet wide, and within has a narrow nave lighted by large pointed windows at each end; this nave is flanked by grouped shafts sustaining a plaster imitation of Tudor groining in the roof. Between these shafts, and occupying the usual position of the aisles, is the common old-fashioned arrangement of book alcoves, in two stories. The building was very much overcrowded and sadly needed more space. The new problem was to build a wing or east transept, about 40 feet wide and about 100 feet long, arranged to accommodate, in the part adjoining the old building, a central delivery room, with the catalogue cases, and, beyond this, a large book-room, 36 feet by 70 feet, to contain as many volumes as could be stacked in such a space, fulfilling at the same time the conditions of accessibility, equality of temperature, abundance of light, convenience of classification, and security from fire and dampness, — conditions which, as I have stated, should be fundamental in such constructions. The new wing was also to contain ample accommodations for the librarian and for his numerous assistants in the bibliographical department. The only architectural embarrassment to which the architects were subjected was the obvious necessity of establishing a certain conformity of exterior between the old and new work.

"I propose to direct your attention only to the book-room, as exhibiting an attempt to meet conditions which are of general occurrence in all large libraries. This, as I have said, is a room 36 feet wide by 70 feet long, its side-walls being a series of piers and buttresses, with windows occupying the whole of the spaces between them. The room is lined with brick throughout, with an air-space between the lining and the outward wall; this brick forms the interior finish of the room. The roof is of concrete fire-proof blocks laid upon iron rafters, with a ceiling of hollow slabs of the same material hung three inches below. It has at the ridge a continuous sky-light of Hayes's patent, and ample ventilating shafts at the ends. The entire area of this room is occupied by transverse courses of shelving, facing in two directions, with alleys between, two feet four inches wide, so arranged as to receive the light from the side windows at either end of each alley, the piers or buttresses between the windows coinciding with the shelving. A passage of sufficient width is carried around against the outside walls. The shelving is supported on a series of iron skeleton uprights, two feet wide and three feet apart, extending the whole height of the building, each having foundation on a short brick pier in the basement. These piers also sustain a floor of North River stone slabs, about four feet above the concrete cellar floor. This space is left open so as to permit a free circulation of air between the earth and the floor, and to prevent dampness from arising. The vertical height of fifty feet from this floor to the concrete ceiling is divided into six stories, each seven feet high, by open iron gratings or foot-plates, carried along the alleys and passages and bolted to the iron uprights, thus forming continuous floors. There are iron stairs at either end, and lifts in each corner for books. Horizontal railways for barrows or sliding boxes may be established on each floor. The iron uprights also sustain the weight of the roof. Each shelf is of wood, thoroughly oil-filled and shellacked, a foot wide and three feet long, resting upon movable galvanized iron hooks adjusted to notches cast in the uprights.[1]

"It seems impossible by any other system to secure the safe and accessible storage of a greater number of books in a given space. Thus this area of 89,000 cubic feet accommodates 263,000 volumes, an average of ten (10) to each running foot of shelving space. The absolute similarity of divisions and subdivisions on each floor offers all needful facilities for defining the locality of every volume by the usual system of numbering, and at least presents no obstacle to classification. In the contingency of any one department of literature overcrowding the space allotted to it, this recurrence of similar divisions and subdivisions, both in horizontal and in vertical directions, seems to offer sufficient opportunity for the necessary expansion without the confusion which is inevitable when the latest acquisitions have to be bestowed in distant parts of the library, as is the case with the ordinary methods of book-stacking. Thus, if we suppose this great mass of shelving space divided into cubic spaces or blocks, and every alternate cubic space allotted to a special division of literature, leaving the others vacant, there remains an opportunity for the enlargement of each division at least in four directions, upwards, downwards, and horizontally, without exposing the collection to the obvious embarrassments of geographical separation. Ordinary arrangements, so far as I am aware, do not offer such advantages, — at least, not in so great a degree; and the expedient of movable book-cases, in use at Oxford, and noted by Mr. Winsor, implies waste of space, an accumulation of combustible material, and other inconveniences which seem to me sufficiently apparent.

"The device of open flooring facilitates the distribution of light, diminishes the weight of constructive material, and renders it easy to maintain an equality of temperature throughout while confining the circulation of radiating steam pipes to the lower story. The end walls are occupied by ventilating or exhaust shafts. It would be strange if the practical use of this book-room for two years has not suggested to the accomplished librarian in charge various ameliorations of structure and arrangement. I am not informed as to what improvements he finds desirable and practicable, nor, on the other hand, have any complaints touching any essential points reached my ears. This attempt to solve the most difficult point in the construction of libraries is therefore offered as a convenient point of departure for further developments towards perfection. It is to be observed that in this structure no sacrifice of convenience or economy has been made for the sake of any architectural pretence. The external aspects of the building are a legitimate growth from necessity, and have been adjusted so as to secure a proper and decent harmony of proportions and a just significance of detail, no more and no less.

"A dry and fire-proof book-room, such as I have described, accommodating 263,000 volumes, may, at present prices, be built for between $20,000 and $30,000. The administrative and working force required to organize and make useful such a collection of books must of course require ample additional accommodation. It is difficult to offer any useful type for this essential and central portion of a library building; it is a part of the problem which must be governed by local conditions, by the amount of money available, by the character and shape of the ground to be occupied, and by various other circumstances which must give individuality to each case. A public library should occupy a central, accessible space in the town, and it is not to be assumed that areas of indefinite extent are available in which to build ideal libraries. I have simply attempted to explain a structure in which has been secured what seems to me the greatest degree of economy as regards space, material, and cost yet attained in the fire-proof and damp-proof stacking of books for the uses of a public library.

"How such a structure may be adapted in the form of wings to a complete library building of the first class is indicated in the accompanying diagram, which may serve to suggest arrangements compatible with various conditions of service. In this example, each fire-proof wing, at present rates, would cost about $25,000, and the central portion, to which properly a more distinctly architectural character should be given, about $50,000. The book-rooms should be separated from the central building by fire-proof walls, and entered only from the bibliographical and librarian's department. It is to be observed that every additional 4′ 4″ of length to each book-room will enlarge its capacity by 18,720 volumes. The book elevators at A A

[1] See *American Architect* for November 23, 1878. Plates.

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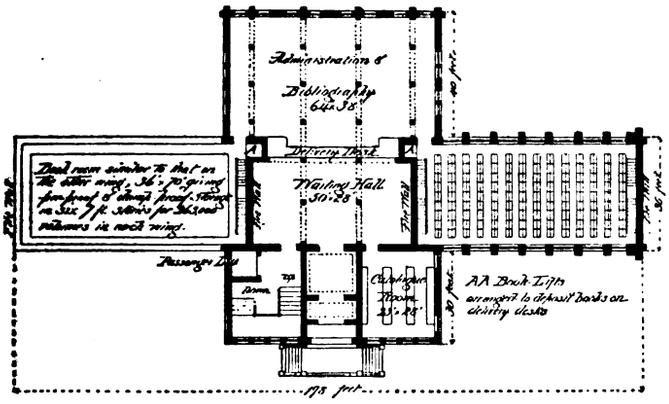
communicate with every floor of the book-rooms, and may be connected at each floor with horizontal railways; these elevators deposit their contents



upon the delivery counter, where their titles may be conveniently entered upon the books of the library, and where they may be promptly delivered to the applicant without confusion or delay. In the second story of this central building may be arranged the public reading-room, a reference library, and rooms for special collections, with access by stairs and passenger lift."

MR. E. BURNE-JONES.[1]

EDWARD BURNE-JONES was born on August 28, 1833, in Birmingham, a city whose hapless library, now rising again from its ashes, might fitly adorn its walls with some reflection at least from the splendid flames of Mr. Burne-Jones's conception of the Burning of Troy.

The boy's parents were Welsh by origin, his great-grandfather having been a poor Welsh schoolmaster. Several earlier members of the line were the same, quiet, inoffensive men who have bequeathed to their descendant the powers of patience and of application.

Living in Birmingham, among inartistic people and surroundings, the child had not much to foster a disposition towards art and especially towards ideal art. But there was an innate tendency, — how inborn who shall say? — and the child of four found it natural to think in drawing, and to revel in little childish sketches. The time was not so far advanced in appreciation, or rather in the recognition of the place and mission, of beauty, as the present. Ruskin's influence, which has since spread with such noiseless multifold footfall, was then unknown. As the boy grew up, his aspirations may have been a little nipped. His father's circumstances were narrow, and probably, to the mind of the district at that time, a boy might as well idle altogether as dream of being a painter by profession.

Burne-Jones went to school in Birmingham, at King Edward VI.'s School, then under the charge of that excellent schoolmaster, the late Dr. James Price Lee, afterwards Bishop of Manchester. From this school the youth passed to Oxford, where he found a chum with whom he has been on terms of the closest friendship ever since, and who afforded him that brotherhood of sympathy which he needed. Half a year younger than himself, William Morris came to Oxford under not very different circumstances from his own, and as full of aspiration. Morris's family was perhaps rather more fully endowed with this world's goods than his friend's, but any impetus that he had received towards an artistic career came solely from within himself. The two young freshmen entered Exeter College together, and within a few days met and began that friendship which has ever since meant so much, and been so much to both.

Morris had written no poems, Burne-Jones had never attempted color. Together they studied carvings, antiquities, and forms of beauty in art and legend at Oxford. There Morris wrote his first poem, which is still in manuscript only; and Burne-Jones, in the middle of his Oxford course, met with a picture which helped him to make definite the career that he had decided on. He had had no help or training, but had sketched by himself, and had not felt moved towards the English painting of the time, when Landseer was dominant and Maclise popular. A picture of Rossetti's, one of the cycle of Dantesque subjects, was to him as a light to tinder, and enabled him to see and choose his way for himself. The picture was that one of Dante kneeling, drawing the face of Beatrice, on the anniversary of her death.

Men who were youths five-and-twenty or thirty years ago consider it would be difficult for the present younger generation to realize what a dearth of imaginative painting there was at that time. Into the dull pond of that period Dante Rossetti seems to have thrown a stone, the rippling circles from which caught poetic minds bent on art, as by a charm.

Burne-Jones felt — perhaps only dimly at that time — that he wanted to be shown how what has been the glory of literature could be put into painting. Biographical painting, dramatic painting, there had been, but poetical painting, corresponding in its own domain to the work of Chaucer, Spenser, Shelley, Keats, in the province of literature, had not been in England until Rossetti inspired a new school with something of the old Florentine feeling. Burne-Jones was ready and ripe for this touch, and Morris and he, studying in sympathy together, the one finding poetry in word-painting, the other in the field of the brush, were able to work out some preparation for a life. The routine of an academy course might have rendered Burne-Jones's career an easier one in some respects, but while insuring more scholastic correctness, it might also have somewhat quenched the glow and impaired the free individuality of his poetico-pictorial conceptions. Holman Hunt was a painter who for a short time now also strongly affected Burne-Jones. His Light of the World, his picture of the Druidic Circle, and his Two Gentlemen of Verona had their influence upon the young man's fancy.

The college to which Burne-Jones and Morris belonged was a large one and slightly fast; and probably the pair of friends had not very much in common with the average undergraduate, and consequently lived rather a secluded life amid their hopes and dreams. Four years they were at Oxford together, and then came to London, which now in the concentration of its aggregate of genius and the variety of opportunities which it offers to the student of every kind may fairly be styled the greatest university in the world. Morris came to London with Street the architect, who was then migrating from Oxford, and Burne-Jones and he established themselves in lodgings together, where they lived for two or three years. Swinburne was also at Oxford with Burne-Jones, overlapping his last term or two by his own freshman term, and has been a friend ever since, dedicating to him "affectionately and admiringly" his first series of "Poems and Ballads."

Burne-Jones now (1856) turned seriously to painting as a profession. He obtained an introduction to his hero, Rossetti, who met him with great kindness, and has been his only master. Of his debt to Rossetti, who is only about five years his senior, he is accustomed to speak as if it were beyond reckoning. The younger man not only received the technical and spiritual enlightenment he needed by watching the other, a whole summer through, at his work on a picture from beginning to end, but he also received that which with his extremely sensitive nature he sorely needed in the inception of his own work, the kindly attention and fostering encouragement, the exercise of which really constituted Rossetti his father. For some time his work was, in the obedience of a young nature, an imitation of Rossetti, but in a few years his own expression was attained. His method and manner of work came by degrees; with different subjects and his own fancy came different treatment, until now there is a considerable gap between them, Rossetti clinging more to realistic life, while Burne-Jones inclines to ideal work and abstract forms of beauty.

From the time when he began to work until now, Mr. Burne-Jones has labored incessantly, with scarcely any intervals for rest. That such has been the case will be manifest to any one who thinks of the magnitude and importance of the work done, and reflects on the fact that the painter is still full four years short of fifty.

In 1857–58 Burne-Jones was associated with Rossetti, Morris, Prinsep, and others in the production of a series of fresco paintings in distemper upon the walls of the Oxford Union Debating Room, illustrative of the cycle of Arthurean romance. This work arose out of a suggestion made by Woodward, the architect, and was originally intended to be a slight matter, to be done in about a fortnight. It is sad to think that owing to the walls not having been properly dried or prepared, the paintings are rapidly becoming spoiled.

In 1861 was the beginning of the now well-known house of Morris & Co., Mr. Burne-Jones being one of the originators. It was then hoped that the scheme would embrace fresco painting, it being the intention to do representations of legends for the walls of public buildings or other places. This project has never been developed in the way of ordinary business; Burne-Jones, however, designed many stained-glass windows, for which the firm gained honors.

[1] From the *University Magazine*.

UNDERWRITING *versus* COMMON SENSE.

47 DEVONSHIRE ST., BOSTON, September 6.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — It was my fortune to have in charge the construction of the Academy of Music in Fall River. This is a theatre with two galleries, and seats nineteen hundred persons, with standing-room for about three hundred. The theatre is a comparatively small section of a large and substantial building, containing banks, stores, a court-room, and numerous offices. The stores extend across from street to street under the theatre, as well as under the offices. The entire second floor is of rolled beams and corrugated-iron arches, levelled up with concrete and ceiled below with plastering on iron lathing suspended from the beams. Two sides of the theatre are made by external walls, and upon the other two it is separated from the rest of the building by a heavy brick wall which is carried through the roof. The few openings necessary through these interior walls are protected by doors of wood covered with galvanized sheet-iron. Within the theatre, the gas, both before and behind the curtain, is lighted by electricity, the lights upon the stage being carefully guarded. Estimates were obtained for a duplicate sprinkling apparatus for flooding first the stage, then the entire house if required, and orders for this work were about to be given, just as questions of insurance came up for consideration by the owners; the contractors having insured up to this time, carrying, of course, a "mechanic's risk." It was the reasonable expectation of the owners, that the care and expense which had been devoted to reducing the fire risk upon this

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building would meet with some recognition at the hands of the underwriters. But how were they met? The gentlemen to whom they applied, representing companies within the "Union," proposed to take from them the same percentage that they were charging for an old theatre in a neighboring city, also in the second story, but built with light walls, wooden under floors, and heated by furnaces, the gas lighted with matches, or however otherwise, and all without a single protection other than the fire department of the city against a sudden and fatal conflagration. They simply made no concession whatever on account of what had been done or what it was proposed to do. In view of this, the owners thought it about time to begin to economize, so, naturally, the *sprinklers were not put in.* Subsequent to this, insurance was taken at somewhat reduced rates, by companies outside the "Union." The logical inference from all this seems to be, that recognition by underwriters of the efforts of owners to improve their risks is to be considered an irregular proceeding.

Now, all along for weeks previous to the completion of the theatre, the entire building had been full of dry lumber, chips, shavings, and other combustible materials. Neither the sashes nor the doors to close the openings in the theatre walls were in place. Work was being pushed on the theatre by night as well as by day; a huge ring of open gas-jets in the centre of the house giving the needed light, while from the stagings above, shavings occasionally fell, being carried through the gas light on their way to the wooden floor of the parquet, where watchmen were supposed to be on the lookout for them. Pails of water scattered about were the only means at hand for checking on the instant a conflagration for which the fuel, the fire, and occasionally the wind were present and ready, and which, under the conditions then existing, would probably have led to the destruction of the entire building; and yet, for this great risk the underwriters charged the contractor *two fifths less* than they proposed to demand of the owners for the completed building with all its safeguards, including the contemned sprinkling apparatus all in working order!

H. W. Hartwell.

NOTES OF EXPERIENCE AND INEXPERIENCE.

37. Echo. — I should be obliged if any of your readers could suggest a remedy for an echo in a church of the following dimensions and shape: 62′ × 40′, with side wings or transepts 40′ × 15′ each, all angles hipped, with gables formed on two sides and front; ceiling 25 feet to plate, and 13 feet in roof, following rafters part way, and thence at about an angle of 30° to centre. Walls and ceiling plaster, moulded ribs to ceiling. 9″ recessed arch at back of pulpit only. There are diagonal tie-rods, which I thought would break sound-waves, but they do not appear to. Would wires be of any use? If so, how should they be placed? Provincial.

NOTES AND CLIPPINGS.

A Monument to Lafayette. — A meeting has lately been held in Baltimore at which was organized the Lafayette State Association, which purposes to raise about $20,000 by subscription for the erection of a monument to General Lafayette in Druid Hill Park, to be unveiled on the centennial of the declaration of peace between the United States and Great Britain, in 1883. We trust that his memory is not to be perpetuated by a builded obelisk.

The Main Exhibition Building at Philadelphia. — The fate of the Main Building is still undecided. Mass meetings have been held in the interest of its preservation, and long petitions praying the Park Commissioners to rescind their order have been received by them. Even the City Council adopted at a recent meeting the following resolution: —

"*Resolved*, That the Park Commission is hereby requested to rescind their action in reference to the Permanent Exhibition Building."

An American School of Sculpture. — The ladies of Cincinnati have exhibited during the last few years an energetic pertinacity in their endeavor to advance the interests of the polite arts in that city, which is rather unusual in the sex, and we trust that the enthusiasm which has borne such promising first fruits will increase with the development of the several schemes for education in the various branches of art which they have set on foot. Their latest enterprise is the endeavor to establish a school of sculpture. To this end the ladies of the Art Museum Association have opened negotiations with Mr. Preston Powers, whose name is almost as familiar to American ears as that of his father, hoping to induce him to make his home in Cincinnati, and to receive pupils into his studio after the manner of the modern masters in Paris.

An Ancient Crypt in London. — In laying the foundations of a bank building in London, adjoining the Temple Bar, the workmen have discovered a series of Gothic arches in stone, springing from circular columns, the bases of which and the floor area, now revealed to view, are upwards of twenty feet below the street level of the Strand and Fleet Street. The arches are at right angles, and seem to have belonged to a crypt under some ecclesiastical edifice.

The late Inhabitants of the Tuileries. — The architects of the city of Paris were surprised on taking possession of the palace of the Tuileries to find it inhabited in every nook and corner. Numerous families were found living in the wing by the river-side. Many of them could not say by what right they were there; some dated back their residence to the time of the restoration, in 1830; and at the time of the fire in 1871 they took refuge in the wing from which they have just now been ejected to make room for the municipal council. But the most extraordinary thing was that in the imperial stables, with their marble troughs and mahogany mangers and racks, were found a numerous company of horses, which have for many years been gratuitously stabled there. — *Exchange.*

Tunnelling Mont Blanc. — The Geneva correspondent of the London *Times* telegraphs: "A Savoy newspaper states that M. Charden, senator from the department of Haute-Savoie, has been informed by M. Freycinet, French Minister of Public Works, that the engineer-in-chief of the department of public works has been instructed to make a preliminary study of a project for tunnelling Mont Blanc."

Women as Artists. — According to the *Gazette des Femmes*, 871 female artists exhibited at the last *Salon*, of whom 73 have been recompensed at one time or another in their careers, as follows: 14 have received first medals, 19 second medals, and 39 third medals, while one, Rosa Bonheur, has been decorated with the order of the Legion of Honor. Of those exhibiting this year 31 were represented by sculptures, 138 by portraits or figure paintings, 277 by paintings on porcelain or enamel, 112 in water-colors, 21 by engravings or lithographs, while the remainder exhibited pastel drawings, fruit-pieces, and miniatures.

The Pantheon. — The Pope and College of Cardinals at a late meeting discussed the propriety of requesting the Italian Government to restore to the Holy See the Pantheon of Agrippa. To what use they propose to put it is not stated, but there is small likelihood that the request, if ever made, will be granted, for by the burial within it of the late Victor Emanuel it may be considered consecrated as the mausoleum of the kings of Italy.

The Indian Temple at Amritsar. — As to the golden temple at Amritsar, called Hari-mandir, or sometimes Durbar Sahib, it may be said to rank next to the Taj at Agra as one of the most striking sights of India. To form an idea of the unique spectacle presented by this sacred locality one must picture to one's self a large square sheet of water, bordered by a marble pavement, in the centre of a picturesque Indian town. Around the margin of this artificial lake are clustered numerous fine mansions, most of them once the property of Sikh chiefs, who assembled here every year and spent vast sums on the endowment of the central shrine. One of the houses is now occupied by Sirdar Mangal Sinh Ramgharia, a well-known and much-esteemed member of the Sikh community. It has two lofty towers, from one of which I enjoyed a grand panoramic view of the lake and its vicinity, — one of those rare sights seen at intervals during life which fix themselves indelibly on the memory. In the centre of the water rises the beautiful temple with its gilded dome and cupolas, approached by a marble causeway, and quite unlike any other place of worship to be seen throughout India. In structure and appearance it is a kind of compromise between a Hindoo temple and a Mohammedan mosque, reminding one of the attempted compromise between Hindooism and Islam, which was once a favorite idea with both Kabir and Nanak. In point of mere size the shrine is not imposing, but its proportions strike one as nearly perfect. All the lower part is of marble, inlaid, like the Taj, with precious stones, and here and there overlaid with gold and silver. The principal entrance facing the causeway looks toward the north. The interior is even more gorgeous than the exterior. On the ground floor is a well-proportioned vaulted hall, its richly gilded ceiling ornamented with an infinite number of small mirrors, and its walls decorated with inlaid work of various designs, flowers, birds, and elephants. Four short passages, entered by carved silver doors, one on each of its four sides, lead to this vaulted chamber, giving it a shape not unlike that of a Greek cross. All around on the outside is a narrow corridor. In the interior, opposite the principal entrance, sits the presiding Guru — his legs folded under him on the bare ground — with the open Granth before him. He is attended by other officials of the temple, who assist him in chanting the sacred texts. And be it observed, that although the temple is conspicuously free from images and is dedicated to the one Supreme Being (under his name Hari), a visible representation of the invisible God is believed to be present in the sacred book. The Granth is, in fact, the real divinity of the shrine, and is treated as if it had a veritable personal existence. Every morning it is dressed out in costly brocade, and reverently placed on a low throne under a jewelled canopy, said to have been constructed by Ranjit Sinh at a cost of 50,000 rupees. All day long chowries are waved over the sacred volume, and every evening it is transported to the second temple on the edge of the lake opposite the causeway, where it is made to repose for the night in a golden bed within a consecrated chamber railed off and protected from all profane invasion by bolts and bars. — *Contemporary Review.*

Assyrian Explorations. — Lieutenant Kitchener, R. E, who has done such good work for the Palestine Exploration Fund Society, will henceforth conduct for the trustees of the British Museum the explorations at Mosul and elsewhere in Assyria, which have hitherto been carried out by Mr. Hormuzd Rassam.

Russian Traction Engines. — It is reported that the Russians will use steam traction engines on the steppes, without rails, in the Turcoman expedition.

The Effect of Pressure on Powdered Substances. — A member of the Belgian Academy of Science, Mr. Spring, has made some experiments on the effect of pressure on powdered substances. He subjected, amongst other things, a quantity of powdered poplar wood to a pressure of twenty thousand atmospheres (about 280 tons per square inch). The result was a block having greater hardness than the natural poplar wood, and having a specific gravity of 1.328, while the natural wood has a specific gravity of only .389.

Jewish Patrons of Ceramic Art. — In the eighteenth century the laws of Prussia required that every wealthy Jew who married should buy his porcelain at the royal manufactory in Berlin. The director often took the money and made his own selection of pieces to be given in exchange. Moses Mendelssohn, although celebrated as a philosophical thinker and writer, was obliged to submit to the law, and he received forty porcelain apes, of life size. Some of them are still preserved in the Mendelssohn family. This method of oppressing conscience for the development of ceramic art was established during the reign of Frederic the Great, the philosophical king. — *Archives Israélites.*

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WE noticed in our number for the first of March, of this year, the late Mr. R. G. Hatfield's article on the Old Mill at Newport, which appeared in *Scribner's* for that month. In the current number of the *Magazine of American History* is an interesting article by Mr. George C. Mason, Jr., which gives the most satisfactory account of the mill that we have seen, because it is founded, apparently, on the most careful examination. Mr. Hatfield, it may be remembered, espoused the theory that the building was a baptistery built by the Northmen of the eleventh century, collating its style and form with the records and traditions of the settlement of Finland. He enforced his argument by the examples of their early baptisteries, especially that at Asti, and conjectured that the Newport tower had been encompassed by a circular aisle with a lean-to roof, whose rafters were propped from the abaci of the round piers that project beyond the outer face of the tower's wall. Mr. Mason adopts the mill theory. He gives a minute, and, in the main, a very clear account of the building, illustrating it by careful drawings with measurements, showing the whole interior face of the wall in sections. He proves the existence of an upper floor and staircase that have commonly been overlooked, and carefully examines the windows and fireplace. Floors, windows, and a fireplace are fatal to the theory of a baptistery, unless they are later additions, and Mr. Mason's examination makes it difficult to believe that they were added. He assumes, tacitly, that with the baptistery theory the whole mediæval theory is exploded; and, indeed, it has been taken for granted on both sides that if the fireplace were original the building must be modern, on the ground that it was not customary to build fireplaces in the eleventh century, when the Danish colony flourished. On the positive side of his argument, Mr. Mason shows that the masonry and mortar of the tower are like those of houses built during the life of Governor Arnold, to whom the earliest ownership of the mill is imputed, who died in 1677; and he also shows that the governor lived in England, not far from the mill built in Leamington, from designs by Inigo Jones, which has been brought forward as the prototype of that at Newport; that he was there when it was built, and that his will proves him to have owned a farm in England when he died, so that he was undoubtedly familiar with the mill there. From these facts and indications Mr. Mason concludes that the governor is likely to have built the stone mill in imitation of the English one, — the more so since it is on record that not long before his death his wooden mill was blown down.

THERE is other collateral evidence in the paper which makes out a pretty strong case, though necessarily not a conclusive one, in favor of the mill. The connection with Leamington through Governor Arnold is one of the most persuasive factors in the argument, for it takes away the need of looking back to the Northmen at all. The questions of the date of the building are nevertheless not inseparable, so that it is not necessary to assume that if the theory of a baptistery fails, the mediæval hypothesis goes with it; nor that if the tower was built in the seventeenth century it must be a mill. In the matter of construction there are still some points which suggest questions. The setting out of the round piers beyond the wall remains a puzzle. The fireplace is remarkable. It is sunk in the wall, with square jambs, well bonded, a hearth or shelf built in at both ends, and an arched opening; all as if it had been there from the beginning. And it has two curious flues in the thickness of the wall, leading from the corners, the fireplace between them being roofed with a flat stone. These flues are very small, only five by eight inches, one straight and rough, the other smoothly pargetted on the inside and carried sidewise as well as upwards in a lateral curve, so that its top is not over the fireplace, but considerably to the right of it, perhaps an eighth of the circumference. The flues are carried up nearly to the top of the wall, and open, not upward, but laterally, through small holes in the face of the wall (the outer face, we presume), being covered with flat stones.

THIS construction suggests some curious inquiries. How did it happen in the seventeenth century, before Count Rumford was born to narrow chimney throats, and when it had been the habit from time immemorial to build flues as large as fireplaces are now, that a fireplace was built in this strange manner, closed at the top and with a minute flue in each corner? Why was one flue crooked and the other straight, one plastered and the other plain? Why were there two flues, both built in such a difficult way? Where could the smoke have gone when a fire was made? Now there is comfort for the mediævalist in the facts that though the beginning of chimneys is commonly ascribed to the twelfth century, they were common all over Europe in the early part of that century and must have been invented some time before; and that the earliest English chimneys known, being of the date we have mentioned, are sunk in the wall, without the overhanging hood characteristic of the twelfth century, but with little or no projection, and have small flues carried up in the thickness of the wall, leading to little openings in its outer face, quite like those at Newport. We may instance some in Rochester Castle, ascribed to the year 1130, and one somewhat later in Conisborough Castle, illustrated in the fourth of our papers on the "Open Fireplace" (*American Architect*, December 7, 1878). And again, if the Newport tower, built, let us say, in the seventeenth century, was originally intended for a wind-mill, what need had it of a fireplace any more than a baptistery? In fact, if one were asked to say in what kind of building an open fireplace was most out of place he might be tempted to answer, Next to a powder-mill, a wind-mill. And this leads us to ask if it is clear, after all, that this niche with its queer little flues was a fireplace? Does Mr. Mason see proof, for instance, or does he only conjecture, that the top of the lower floor came up, as he says, to the level of the hearth, which is by his drawing four feet above the under side of his beams? Do the opening and the flues give any proof that they have been used for fires? Or, if not for this, for what possible use could they have been intended?

WE have received the first number of a new architectural journal, called the *Western Architect and Builder.* It is a quarto, which it is proposed to issue monthly, containing four pages of letter-press, and promising to furnish six lithographic plates of designs, though the present issue offers eight, at a price of fifty cents per number. The editors and publishers are Messrs. Dannmeier & Zimmermann, architects, of St. Louis. The *raison d'être* of the publication, as explained in its salutatory, is that "architecture has of late years undergone such radical changes that the old architectural publications have ceased to be of any practical value," and that "no new publication corresponding to the spirit of the age has been offered to the western public;" for although several eastern journals are circulated at the West they "are of little practical use," except for their reading matter, "because they contain no designs adapted to western requirements." To this one can only reply that the spirit of the age is a somewhat complex spirit, whose manifestations are not confined to the Mississippi Valley; but that the West certainly has a right to circulate its own manifestations. The letter-press furnished us contains, besides the description of the plates, a criticism of a work by Mr. Marcotte, another St. Louis architect, which the writer does not like, a paragraph or two of St. Louis building statistics, and a number of small items of technical interest. It also offers a short article on The Modern Style, and another on Bricks in Architecture. Both contain historical statements and conclusions which surprise us, or which we do not understand; as, for instance, that Gothic brickwork

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"was always concealed, because no ornamental beauty was expected from it;" that "not until the introduction of the English Gothic were any efforts made to give brickwork ornamental importance;" that while Greek is the style of the exterior, Gothic is the style of the interior, and that it cannot be used in cabinet-making; that Gothic had maintained itself for centuries as the ecclesiastical style until English architects "undertook to adapt it to other buildings," when there arose the English Gothic, "a style that is met with all over the world." This might prepare us to believe that the current histories of architecture at least are not adapted to western requirements, and are found of little practical use there. To take the place of the styles found to be so unsuitable there has arisen, says the article, a style, "now prevalent and still nameless," which it is the purpose of the new journal to set forth. When we come to consult the illustrations we find that this style, as might indeed be expected, is simply that which, since we found it nameless, we have been tempted to call the Vernacular. The plates include plans and exteriors, with one or two scale drawings of detail, for a city house with shops under, one without shops, a small cottage, and a staircase. Criticism of the rendering of the drawings is disarmed by the avowal that they are not intended to grace the parlor, but for use in the workshop. As to the designs we shall perhaps best please the authors by expressing no opinion.

The late building accident in East Fourteenth Street, New York, was one of the most suggestive of its kind, though happily less fatal than many. The house whose floors fell, No. 10, was rebuilding; its neighbor on one side, No. 8, had been pulled down, and the party-wall on that side taken away, while No. 12, on the other side, was undisturbed. It was decided to preserve the floors, which had been supported on a longitudinal brick partition; and while the partition was removed down to the basement they were left shored up by joists in four tiers which bore upon a dwarf wall below the basement floor. The four upper floors then were balanced midway upon these tiers of joists, one end of the beams being supported by the party-wall of No. 12, but not anchored to it, and the other left entirely free by the removal of the opposite party-wall. In dismantling the house piles of brick and lumber were laid on the outer ends of the floors in order to ballast them and guard against the danger of their being upset by sudden gusts of wind. Workmen meanwhile were busy building new foundations in the cellar and laying up a new lining against the party-wall, and it is thought that they had disturbed the bearing of the footings under the tiers of joists, which had been noticed, it is said, to settle somewhat, and had led the contracting carpenters, Messrs. McGuire & Sloane, to conclude that something would have to be done to guard against accident. But suddenly the whole gave way at once, and floors and joists with their load of bricks and rubbish tumbled together into the cellar, burying in the ruin the men who were at work below. As it happened, the men were just getting back to their work after dinner, and only four of them were caught in the fall, while the timbers, stayed somewhat at one end by the wall on which they rested, were piled against the wall in such a way that the men beneath, were not crushed to death, though all were injured, and it was some time before they could be dug out. If the fall had occurred a quarter of an hour later, when all the men were at work, it must have been shockingly fatal.

This is a kind of accident against which, since they come from the want of judgment of those who suffer from them, it is difficult to provide. Workmen are reckless, and not apt to take any precautions that are not ordered. The builders who employ and direct them trust habitually to slight and rather perilous constructions; and their judgment of safety in unusual contingencies is not very secure, tempted as they are, for economy's sake, to err on the side of danger. But it is the unlucky workmen, relying on the precautions of their employers, who risk their lives, and it is with their protection against unnecessary dangers that the community ought to concern itself, — a matter which gets more attention abroad than here, and about which a commission of the British Parliament has lately been busy, if we remember rightly. Workmen will be reckless forever, and to secure them against the consequences of this is impossible as well as superfluous; but something may be done to protect them against the carelessness or errors of the employers whom they trust. The obvious remedy is in making such accidents so costly to those who are responsible for them, through payment of damages, or even, in flagrant cases, by severer penalties, that it will pay better to be cautious than to run risks. There is, however, one other means of meeting such dangers which is better than punishment, that is, by insisting that competent persons shall be employed to guard against them. In this case the proprietor, to save the cost of resetting his floors, required of his contractors an extra-hazardous and difficult handling of his construction. The contractors, apparently not equipped by their trade with the knowledge necessary to estimate a danger of this unusual kind, and habituated to saving their money, did the work in a very precarious way, — perhaps did not watch their workmen to see that they did no mischief. When a thing of this kind is undertaken it ought to be under the care of some one who has the eye of an engineer, unless builders are trained to more precaution than they are used to at present. The building, it is said, was under care of an architect, though we are not told whether he was superintending it. But the architect is employed in the interest of the owner, and is apt to attend only to things which affect the final result to the owner; nor would most contractors welcome interference in things which concern only their handling of their work and the workmen.

The sudden death of Mr. W. M. Hunt takes from Boston the chief of her living painters, the one who has more influenced her art and represented her abroad with more praise than any other painter, except Allston. Mr. Hunt was not a native Bostonian, having been born in Brattleboro', Vt., in 1824. He entered Harvard College in 1840, but found himself little in sympathy with the instruction which he received there, of which he was apt to speak in after life with no great respect. Weak health and distaste for his college work led him to abandon his course unfinished, and he went to Europe. There he soon gave himself up to his natural bent as an artist, and in 1846 entered the then famous academy at Düsseldorf as a student of sculpture; but it was not long before he turned away from sculpture to painting. Nothing could well be less in accord with Mr. Hunt's mature work than the manner of painting taught by the Düsseldorf school, though connecting threads between himself and his early teachers may be found in their common revolt against academic formalism, and their devotion to the direct study of nature, side by side with a tendency to what was called the romantic in subject and treatment. From Düsseldorf he went to Paris, where his inclination was shown by his turning from the instruction of the school and putting himself, in 1848, under the teaching of Couture, himself a revolter against academic restraint, and then in the freshness of his fame as the painter of the Decadence. On Couture's work he seems to have first formed his style, and his pictures for some time showed the marks of his influence. Later he was attracted by the paintings of Millet, under whose teaching he hastened to put himself; whom he sought out before he had become conspicuous; for whose art he showed to the end of his life a warmer admiration and sympathy than for that of any other living painter, and whose effect on his own work was very marked. He returned home in 1855, or thereabouts, and establishing himself in Boston thenceforth divided his time between there and Newport, with occasional visits to New York and to Europe.

Singleness of idea, clearness of impression, unity in effect, and a disregard of anything which was not essential to his main conception, are the chief characteristics of Mr. Hunt's pictures. Concentrating all his attention on what he called the picture in his subject, he was careless, or even scornful, of obvious resemblances, to a degree that made his painting unattractive to eyes that were untrained and unsympathetic; and he was equally disdainful of the display of technical dexterity. His pictures, therefore, full of the feeling of nature as he saw her, expressed with rare force and distinctness, were not likely to attract popular favor, to which, indeed, he never made the smallest concession; but they gave him a place entirely apart among the artists around him, and were prized by his fellows and eagerly sought after by purchasers who had, or would fain have, the cultivation to enjoy them. He painted a small number of figure-pieces, most of which have become known through prints or photographs. The Marguerite, which brought him great praise on his return from Europe, the Drummer Boy, the Bugle Call, are among the best known. Most of his works, however, were portraits or landscapes. Of these last, in spite of his training as a figure painter, he produced more than of any

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other kind of work. He painted them with all the feeling of a poet, but with a single eye to general effects, and a neglect of detail that made them unintelligible and sometimes repellant to the ordinary observer. He produced fewer conspicuous works than might have been expected from his unusual ability; partly, perhaps, from personal reasons; partly, no doubt, because, as is declared by a brother artist, there is no temptation to paint great pictures here, for nobody wants them and there is no place for them. One brilliant opportunity, however, occurred to him but a little while before his death, and he seized upon it with his accustomed strength and ardor. When there was a question of decorating the new assembly chamber in the Capitol at Albany, Mr. Hunt was naturally the person to call upon, and for it he executed last winter the two noble mural paintings which we have before described at length. Undoubtedly the zeal and assiduity with which he devoted himself to this work robbed him of a large portion of his strength, if they were not the direct cause of his untimely death.

IT is not easy to measure Mr. Hunt's influence on the practice of painting in this country, though in his own city it was unquestionably great. His qualities were essentially those of a leader, but the artists whom he found at work when he returned from Europe were a disunited body, and were not disposed to unite under a leader. His chief influence was upon the public and upon the young pupils whom he soon gathered about him. He returned when the distinguishing characteristics and methods of modern French landscape painting were fresh and were almost unknown among us. He found a community whose idea of painting was of little else than the careful representation of natural objects. He enforced by his painting, and set to work to instill into his pupils the French doctrine of "values," and the distinction between a chance collection of forms and a picture. A crowd of pupils, some of them young artists by profession, but most of them amateurs, and chiefly women, flocked about him, and spread his views and the admiration of his work throughout the community. To them he devoted much time and strength, and to them he must have sacrificed much of the creative work which he might have accomplished. He gave an entirely new direction to their efforts, compelling them to look before all things for the "picture" in the scene or objects before them, the arrangement and value of tints; to give their whole effort to the rendering of this and to sacrifice to it the delineation of detail. He was the unbending foe of purists and "nigglers," alike of the followers of Ruskin and the advocates of South Kensington methods. Few painters have had a more devoted following, or have left a more unmistakable mark upon the community immediately around them.

NOTICE OF THE THIRD COMPETITION IN INTERIOR DECORATION.

THE subject for the third competition in interior decoration, as published in the *American Architect* of April 5, is a railing enclosing the lowest gallery of a natural history museum. The railing to be two feet and nine inches high, of brass or wrought-iron, supporting gas-fixtures.

This programme is certainly sufficiently suggestive to attract an active competition of designs; but only three were received, and in the pressure of other matters on our columns we have been compelled to defer until now our usual notice.

The drawing by *Iron* is presented in a complete and workmanlike manner, with scale elevations, detail to larger scale, and a well-rendered perspective sketch of a corner of the railing. The design is not without ingenuity in its combinations, but its agreeable effect in execution is due more to repetition than to any intrinsic excellence of line. Its elaborateness implies a great expenditure of labor without a corresponding return in effect, and much of the labor is lost in unnecessary detail. The motive of leafage is purely conventional. Inasmuch as the railing is invented for a museum of natural history, it would have been more appropriate if, in respect to leafage, natural characteristics of form and growth had been used as leading elements of composition. These remarks apply with still greater emphasis to the gas standards and brackets, which, though well drawn, are so much entangled with a wilderness of loose spirals, redundant scrolls, and capricious foliation, that even in the geometrical presentation they are difficult to understand; in perspective they are quite incomprehensible. The evident inventive power of this competitor would have been far better bestowed upon an effort to obtain an agreeable and appropriate result with fewer lines and more simple combinations, so arranged that one part of the design should not, as is the case with almost all modern chandeliers, cross and obliterate the others. The lettering on this sheet, by the bye, is entirely unworthy of the drawing.

Anxious has done more wisely in presenting his design in one plane and in adopting a leading geometrical motive which is not difficult to comprehend at a glance. He is less ambitious to be original, and his panels being occupied with very well composed grotesques of animal forms in brass *repoussé*, alternating with formal scrolls of iron-work, the design has a significance which is wanting in that of *Iron*. The application of animal grotesques to the brass-work of gas standards and brackets is unusually good, and the recognition of the nature of the material in these grotesques is ingenious and successful. The combination of brass with wrought-iron work is also noticable as an element of the design. As a composition, however, the railing is too uniformly close, and it is wanting in subordination or contrasts of parts, so arranged as to give emphasis where it would be most effective. Thus, if the narrow upright interspaces between the large panels of the iron-work had been left quite open without any other vertical feature than the dividing stanchion, the alternation of close and open divisions thus obtained would have greatly assisted the composition.

Penn has failed in the same manner, and his design is a mere web of arbitrary and conventional forms without necessary accentuation, and with no contrasts either in the dimensions of the iron composing the bars and scrolls, or in the alternation of close and open features. The only way by which a design so conventional in its forms and so equal in its openwork could be made interesting would be by a judicious and marked variety in the depth if not in the width of the various members. But the perspective sketch, which is not drawn with a firm hand or a neat touch, does not indicate a consciousness that any such effect is to be aimed at. Like the first competitor noticed, there is no significance in the forms chosen, — that is, they would answer quite as well for a theatre, for a balcony, or for any other purpose where a *grille* would be required, — but unlike him, the rendering is wanting in decision and in graphical experience and knowledge. Considering the character of the iron scroll-work, which, being of wrought-iron, would be as costly as it is ineffective, the introduction of the heavy walnut hand rail is a redeeming feature. It is to be observed that the greater expense of hand-wrought work is not justifiable unless the characteristics of hand-wrought work, as contrasted with machine-made or cast work, are made the controlling feature of the composition. It would really be more in accordance with the ideas of morality which have been very properly introduced into modern design, if *Penn* had affixed the legend "cast-iron" instead of "wrought-iron" to his work. Wrought-iron work does not assume such forms as he has chosen.

A MILLIONAIRE'S CATHEDRAL CITY. I.

FEW people, one trusts, except fanatical sanitarians, can have read Dr. Richardson's account of his own ideal City of Health without a shuddering reflection that it would be a doleful place to live in, and that man cannot get on with fresh air and drainage alone. The late A. T. Stewart's Hygiea has pretensions to be something more than a sanitarium. It is a suburb, a sanitarium, and a cathedral town, all made at once and all made to order. It should, therefore, have an economic and an architectural interest, in addition to its sanitary interest. I have found it to possess an interest quite unique. As a commercial undertaking there was a presumption against Garden City, which Mr. Stewart undertook to overthrow, the presumption, namely, that if the place had been eminently adapted for human habitation, it would, long before his purchase, have been inhabited. It is two hundred years since a traveller set forth that "toward the middle of the island lyeth a plain, sixteen miles long and four miles broad, upon which plain groweth very fine grass that maketh exceeding good hay." The plain and the grass have been there ever since, and moreover the plain is part of a region which would delight a railway engineer limited to a very low "first cost." There is some undulation in the country as far from the East River as Jamaica, to which point the Long Island road has run for many years, and this undulation produces a mild picturesqueness which is helped by occasional old farm-houses, unpainted and gambrel-roofed, and hurt by more frequent and more modern box-villas, staring in white paint and covered with mansards. But beyond Jamaica the country subsides into the plain, and at nineteen miles from Hunter's Garden City happens, in the same casual way in which towns occur upon the great prairies, without any visible indication of nature why they should disturb at one point rather than at another the monotonous equality of the landscape. There is a brick station and a brick "manager's office" adjoining it on one side of a square and flat and almost treeless park, traversed by rectilinear roads, and decorated by two fountains kept diligently at play. Opposite the station is a large hotel of brick, and at one side of the park a row of low-built brick shops. On the fourth side there is nothing as yet. The "cathedral" is behind us and across the railroad track, and the "city" is disposed on straight, short streets about the park. It consists, I should guess, of some sixty houses, some of brick, some of wood, but all suburban villas of the deepest dye, and apparently designed out of the Practical Builder's Assistant. In point of fact some of them are the work of the late Mr. Kellum, I believe, and some of his successor in the office of architect to the estate. What trees there are are all newly planted, and do not at all relieve the general sense of aridness and glare. Northward, but far away, there is a low fringe of deep-colored woodland, and to the south one sees the white steeples of Hempstead rising from a real grove.

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The hotel, which is by Mr. Kellum, is in the most nefarious manner of that master. Its raw brick front is relieved by a veranda, shiny with white paint, and by a sheet-metal cornice of great projection, with the predestinated round pediment in the middle. The shade of the master may be disquieted to learn that the paint has peeled from off a great portion of this cornice; but it will interest architects to know that Mr. Kellum, in Garden City at least, constitutes an exception to the public disregard of professional eminence, and more successfully than his cornice defies the tooth of time. He is one of the Lares of the place, and his name is quite as familiar in men's mouths as that of the other Lar, if the other Lar was a millionaire. At least it was so in the mouth of the only Garden citizen of whom I was able to get free speech. There was nobody in the station, and the telegraph ticked away to vacancy. There was nobody in the manager's office. The clerk of the hotel is a *dame du comptoir*. Passive fortitude distinguishes the female character, and one imagines that a woman succeeded to the office only after a series of affable and gentlemanly clerks had succumbed to the terrors of solitude and the allurements of artificial stimulation. I stood at the intersection of the main streets and looked all four ways without seeing a man or a woman or a horse or a dog. The inference is perhaps fair that as a commercial enterprise Garden City does not pay. It is not easy to get specific information on this point. When one asks how many boarders there are at the hotel he finds only that there are not so many now as there have been or as there will be. One may wander over the building without seeing anybody, but I heard authentically of one actual boarder, and of another who had only lately gone away and who was soon expected back. The hotel can accommodate something like one hundred guests, and it is admirably kept. If any one desires to pursue, in a salubrious atmosphere and under the most desirable conditions of gas and water service and drainage, researches which demand absolute freedom from all distractions, I can confidently recommend it to him. The small boy who was finally visible at the manager's office asserted in an aggressive manner that there were not many houses vacant, but declined to enter into particulars. Perhaps the strongest testimony in regard to the social attractions of Garden City was the explanation of the Sabbath solitude, that "the gentlemen, they go into New York every morning, and the ladies, — well, the ladies go in too." The citizen to whom I have referred was a shopkeeper whom I contrived to wake up and bring out of the recesses of his back shop by persistent banging on his counter. Once awake, he was a candid and voluble soul. He scouted with great scorn the suggestion that as many as half the houses were occupied, or ever had been; announced that he was "praying" for his lease to expire that he might flee, and added, pathetically, "This place has had two great losses, great losses: death o' Stewart and death o' Kellum."

These losses seem to have disposed of the place as a project in real estate, and left it as a shrine to its projector — and to Mr. Kellum. The office seems to be devoted in a particular manner to the former. There is a large photograph of him to be seen there, and the walls are hung with photographs somehow connected with him: photograph of Meissonier's 1807, from the original in the collection of A. T. Stewart, Esq.; photograph of Gérome's Gladiators, from the collection of A. T. Stewart, Esq., and so forth. Then, too, there is the façade of a church in Italian Gothic, peradventure the first suggestion for the cathedral, and I think I recall a photograph of somebody's statue of Hope, intended to decorate the crypt of that monument. Mr. Kellum has his innings of commemoration, so to speak, in the hotel. There you may see a view of the residence of A. T. Stewart, Esq., designed by J. Kellum; retail store of A. T. Stewart & Co., designed by J. Kellum; the Herald Building, Broadway, designed by J. Kellum; the New Court House, New York, designed by J. Kellum; and so forth. The last-named edifice, by the way, is represented, in water-color, as it would have been if the vandal had not laid his ruthless hand upon it, and is surmounted by an iron dome which is really in keeping with the palatial structure.

Our architectural interest, however, is not with Mr. Kellum, but with the designer of the new cathedral, who would very likely have been Mr. Kellum if he had not died before his Mæcenas. It is to condemn Mr. Harrison with praise entirely too faint to say that in that case the church would have been much worse than it is, or will be. There was no question of adapting the design to the ground, since there is no choice in this bare plateau. As there is no choice it seems odd that the cathedral orientation should not have been preserved, instead of being reversed so that the "west front" is the eastern end of the church. The situation has at least one advantage in that the founding line from end to end and from top to bottom is visible from every point of view. Even with this enhancement of its apparent magnitude, the visitor who has the notion of a cathedral in his mind is surprised to see a parish church in size, and recognizes the same inflation of the fact, and of the idea, in calling this a cathedral that there is in calling the suburban settlement a Garden City. The general composition of the church, as it is seen from a distance at which only the mass is visible, is agreeable, and the light chocolate color of the carefully chosen brown sandstone is especially agreeable to the eye. The chief defect one notes in the general view is the relative shortness of the building. The extreme length is in fact one hundred and fifty feet, but is lessened to the eye.

M.

THE ILLUSTRATIONS.

THE ACCEPTED DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK, N. Y. MESSRS. PEABODY & STEARNS, ARCHITECTS, BOSTON, MASS.

DESIGNS FOR A GALLERY RAILING IN A NATURAL HISTORY MUSEUM.

CORRESPONDENCE.

THE GROSVENOR GALLERY. II.

London, August, 1879.

In a former notice a few words were promised about Mr. Burne-Jones's pictures, which formed one of the great attractions of this exhibition. So much has been said and written on the subject of these works that a controversy seems to have been going on all the time the gallery was open. The exhibition, however, is closed now, but the controversy is not, since it is continued by Professor Colvin in one of the monthlies. Mr. Burne-Jones's works, though unseen yet speak, or at all events their advocates for them; and so the Cambridge professor makes a very strong case in their favor. Indeed, a great many strong things have been said on both sides of the question, — it seems to be the fashion to speak strongly either in praise or blame when commenting on such works as these, — yet to our thinking, Mr. Burne-Jones was not nearly so powerfully represented this year as in the two previous years.

His pictures occupied the principal portion of one wall of the East Gallery, and in the centre of the group was his largest work, No. 166, the Annunciation. It is a large upright picture (about eight feet by three or four feet), and contains two figures, the Angel and the Virgin. The scene is laid in a small court or garden of Mary's house. She stands in the foreground beside a well, where she may have come to draw water. The upper part of the picture is occupied by the figure of the angel, who looks down upon her as he utters the memorable salutation. In the background is Mary's house, with a narrow corridor opening into the interior. The whole subject is decorative in treatment, but hard and stiff in both drawing and coloring. The face of the virgin has a most woe-begone expression, as if she has had her life nearly frightened out of her by the vision; and the angel looks more like a stiff figure from an old piece of tapestry, or as if it were carved out of wood and bronze, so hard are the draperies that clothe the figure and so bronze-looking are his wings. Below and behind the angel is a bay tree, rich in the full green tones of its coloring; while over the arched head of the opening (it cannot be called a door) into the house is a carved representation of the expulsion from Eden, thus bringing together, so to speak, the story of Paradise lost and regained. The house is also hard and wooden in its treatment; indeed in this, as in Mr. Burne-Jones's other pictures, we are reminded more of the early Italian masters than any modern school of paintings whatever.

As a representation of one of the greatest events in the history of the human race, we cannot say that this picture approaches the ideal, either in grandeur of conception or vigor of treatment, in power of drawing or beauty of color. We do not suppose Mr. Burne-Jones means us to understand it as a realistic picture of the scene enacted in the house of the humble Jewish maiden, more than eighteen hundred years ago. It is a conventional view of the subject, just in the sense that the early Italian pictures give us conventional representations of scenes from sacred history; but still it does not rise to the dignity of an Old Master, as the type of a great school of painting. In its very conventionality the life seems to have been lost out of the subject altogether, the tremendous results which were to follow this supernatural "annunciation" are nowhere foreshadowed, and the lessons intended to be taught fall as flat as a commonplace sermon.

Four pictures then follow (Nos. 167 to 170), illustrating in four parts the story of Pygmalion and Galatea. They are rather unfortunately hung, inasmuch as two are placed each side of the Annunciation, which is a mistake, as it interrupts the sequence of the events.

Mr. Burne-Jones gives titles to the separate pictures in the following doggerel lines: —

The heart desires. (No. 167.)
The hand refrains. (No. 168.)
The Godhead fires. (No. 169.)
The soul attains. (No. 170.)

Whether Mr. Jones has been inspired by the unusual notice which Cyprus has attracted lately, or not, it is impossible to say, but at all events the scene of this little story is said to have been in the land of Venus's birth. The treatment of the whole subject is again decorative almost to excess.

In the first picture, Pygmalion is standing before a group of the Three Graces. — *Query*, where did he get that? Perhaps he did it himself? — Be that as it may, he is evidently thinking himself capable of a much higher flight still, and pondering in his mind on the coming statue which is to make his name immortal. In the background two or three young girls (models most likely) are seen through an opening in the apartment; they serve to suggest the element of love thus early in the story. In the second picture the statue is finished, and the sculptor pauses, lest another stroke should spoil the perfection of his work, with which he is evidently in love. In the third picture, while the sculptor is probably in the Temple of Venus supplicating her aid, the Goddess of Love visits his studio and

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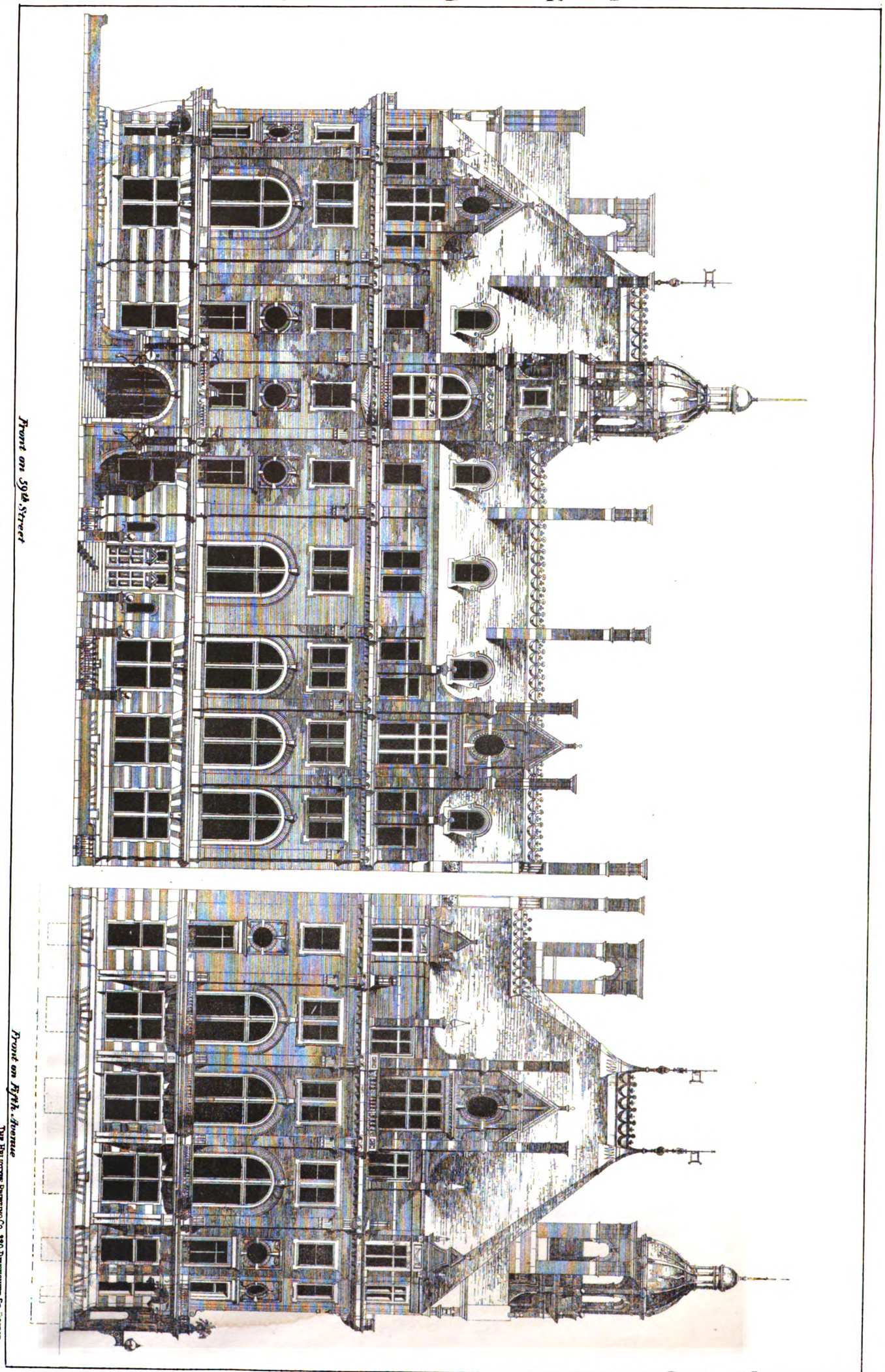

Union League Club House
New York City

THE HELIOTYPE PRINTING CO. 330 DEVONSHIRE ST. BOSTON

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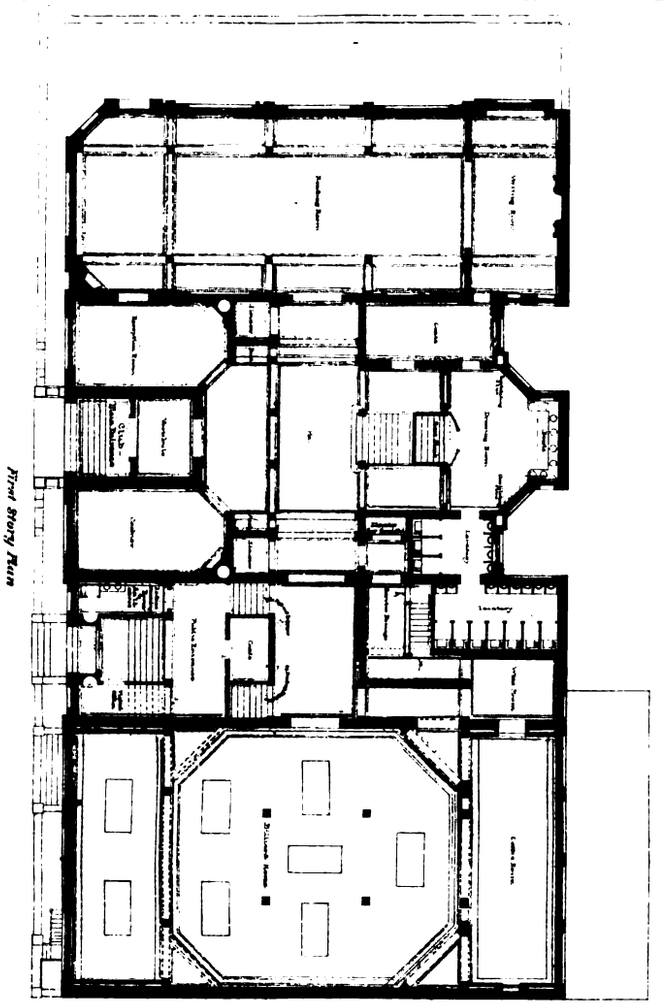
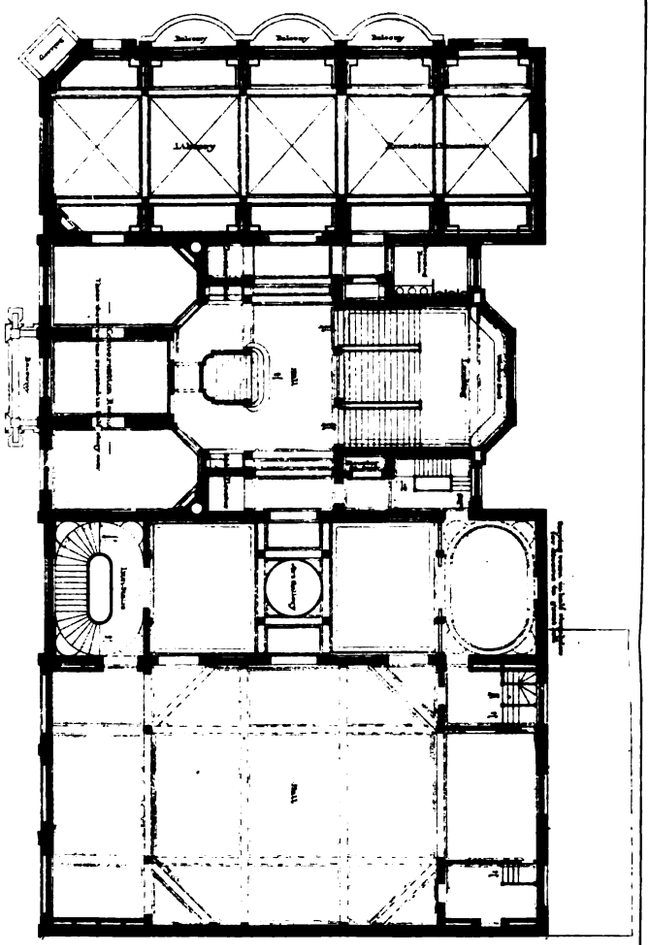
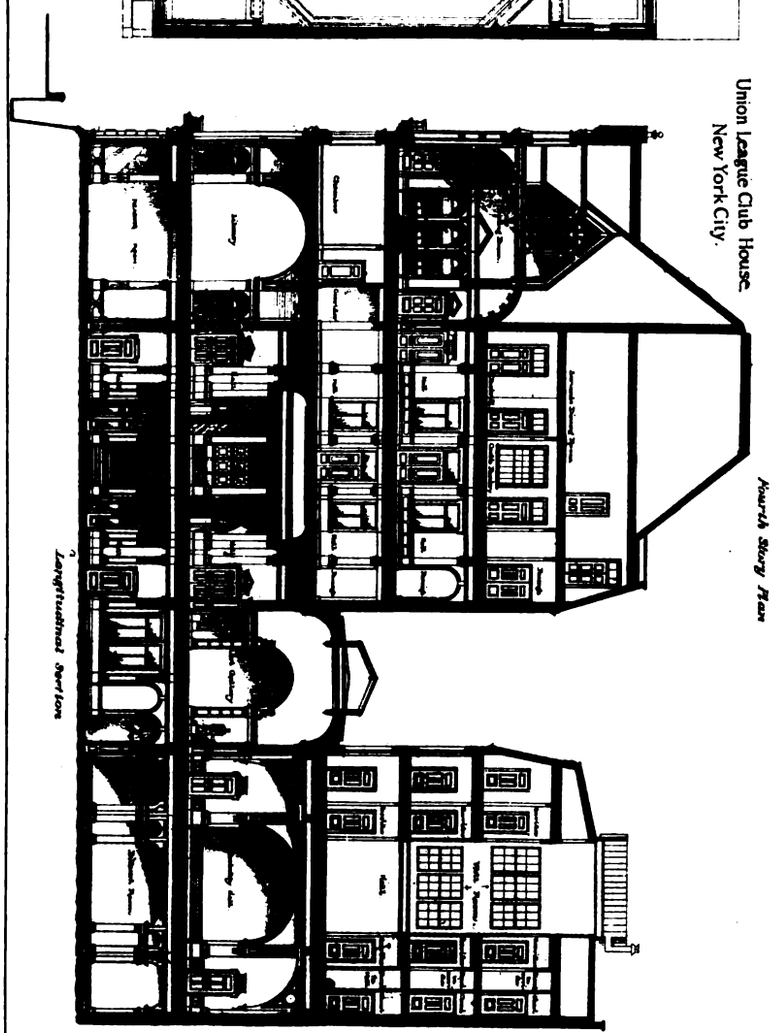


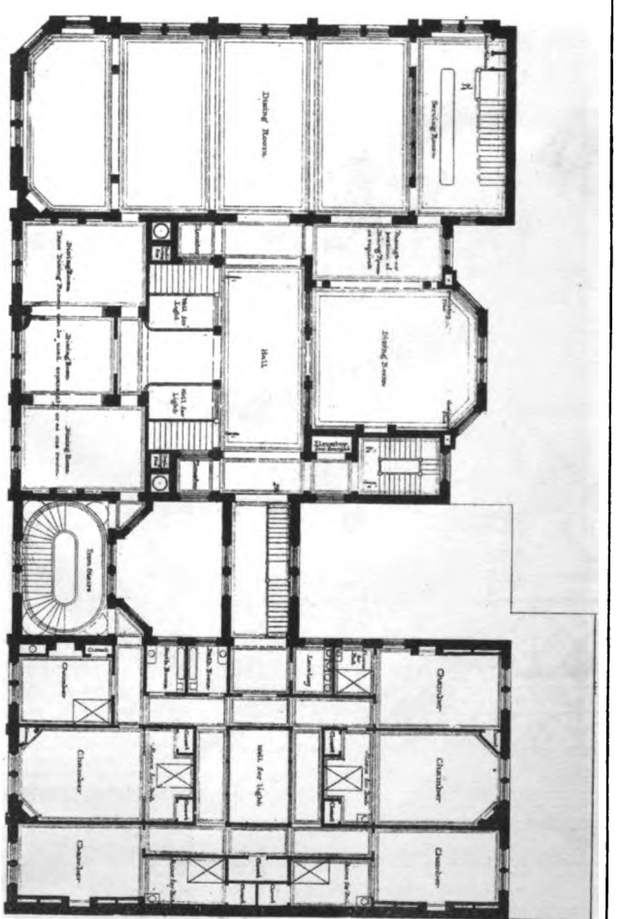
First Story Plan





Longitudinal Section

Union League Club House.
New York City.



Fourth Story Plan

COMPETITION.
NO. III
AMERICAN ARCHITECT
GALLERY RAILING
FOR
NATURAL HISTORY
MUSEUM.
SUBMITTED
BY
ANXIOUS.

DETAILS OF RAILING.

ALL OF WROUGHT IRON EXCEPT FIGURES WHICH ARE TO BE OF BRASS.

RAIL OF BRASS

ELEVATION

SECTION

STANDARD

SCALE OF BRACKET

SIDE OF BRACKET

DETAILS OF BRACKETS AS CAST IN BRASS.

No. III

AWROUGHT IRON RAILING

DETAILS OF ORN. BRACKET

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

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THE HELIOTYPE PRINTING CO. 240 DEVONSHIRE ST. BOSTON.

Union League Club House.
New York City.

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inspires the statue with life. In the fourth, Pygmalion, returning to his studio, is met by Galatea, now a beautiful woman, who welcomes him back, and thus he attains his heart's desires. It will be seen that we have here some grand opportunities for the skill of the painter; and, apart from their mannerisms, the result is that we have a series of beautiful pictures, full of subtle and delicate color and more or less charming drawing. If we once accept the decorative principle of their treatment, it is astonishing how the longer they are studied the more one likes them, — though this favorable disposition cannot blind us altogether to their faults; for instance, taken as a type of female loveliness, it can hardly be contended that Galatea, either as statue or as maid, is the most perfect that is conceivable, in form and feature; her face lacks expression again, unless it be that of inanity; even in the last scene she does not waken to the rapture of the moment; nor in the transition into life in the third picture have we any expression of the dawning of consciousness, such as we might expect from a master like Mr. Burne-Jones. True, the transition of local color from the marble to life is very skilfully treated; still it is all too conventional, and we long for that touch of nature which makes the whole world (of art included) kin. Perhaps Mr. Burne-Jones may insist that this idealistic treatment is the most appropriate; still we are not obliged to admit that this is the most correct or even the only course to be adopted. We venture to think that (without any comparison) an artist with the technical skill and knowledge of, say, Mr. Alma Tadema, would have produced a much more natural, and therefore more highly artistic rendering of the subject, without in the least degree destroying the classicality of the legend. We do not contend for any ultra realistic treatment, but on the other hand are not disposed to rest content with the expressionless conventionality we find in Mr. Burne-Jones's figures.

At the same time no one can deny that there is much beautiful work in these pictures. Mr. Burne-Jones is the leader of a certain school of English painting, a school, whether we like it or not, which is having an influence on the art of our country. Whether this influence is for the highest good, or whether its leader is entitled to all the extravagant eulogiums bestowed on him by enthusiastic admirers and followers, is altogether another question. There is beauty and beauty, as there is art and art, and we humbly think Mr. Burne-Jones has not set himself to follow and work out the highest ideal of either. We were forcibly impressed with this by a picture of Mr. Albert Moore's (No. 172), entitled Topaz, and hung beside the Pygmalion. The subject is two female figures standing together, clothed in the most exquisite draperies. The drawing and coloring of these figures is perfectly wonderful in its beauty. They are decorative in treatment, as all Mr. Moore's work is, but so different in effect from the four pictures just noticed, that Mr. Burne-Jones's pale-faced beauties look weaker than usual from the juxtaposition. So for the same reason, probably, Mr. Moore's figures look more powerful than is his wont; while losing none of that delicacy for which he is famous, they are thoroughly classical in feeling, more so perhaps than any other work in the rooms, notable also for that correctness of drawing we always expect from so perfect a draughtsman as Mr. Albert Moore.

In No. 288 we have a most interesting scale-drawing of a design for a ceiling, by Mr. Walter Crane, who has also sent the full-sized models for several panels therein, such as the central panel (No. 72) representing the seasons with the signs of the zodiac in a circular border, and four of the side panels with a figure in each, namely: Morning, awaking; Noontide, reaping; Evening, returning home; and Night, sleeping. The corner panels have figures of Mars, Venus, Neptune, etc., while the intermediate circles have representations of Jupiter, Saturn, Mercury, and Luna. The whole forms a classical composition very well arranged, and, judging from the full-sized panels sent, admirably drawn and modelled in low relief; these are tinted a bronze color, but we may infer from the scale-drawing that this is only temporary, and that a delicate scheme of color is to be carried over the whole ceiling. This is much more creditable art work than Mr. Crane's more ambitious flights in the way of finished pictures.

We cannot close this notice without a tribute of praise to another painter, who has entered the ranks of the sculptors. Mr. W. B. Richmond sends a powerfully modelled figure, an Athlete (No. 306), a life-sized statue in bronze. The athlete is engaged in running; the figure is poised on the left foot, has the right arm across the chest, and the right leg and left arm thrown behind. The action is well conveyed, the head after the Greek model, and the composition an admirable following of Sir Frederick Leighton's excellent example at the Royal Academy a couple of years ago.

Mr. Burne-Jones also favors us with examples of his skill in modelling, in the shape of four figure-subjects in bronze panels for decorations. They are in low relief and very effective, broad in treatment, and capitally drawn, with all the charm of manner peculiar to the artist.

There are also several etchings by Mr. Whistler, Mr. Herkomer, and Mr. Tissot, very clever indeed, with most excellent effects in black and white, which show that some of our painters are as much at home with metal as others are with clay. Mr. Whistler's etchings have long been known; many think them far greater works of art than his pictures, and Mr. Tissot follows fast on his heels, but with this difference, his subjects are of the same class as his pictures; indeed, often replicas thereof; whereas Mr. Whistler's are more picturesque and interesting than any of his "nocturnes" and "harmonies;" instance his riverside etchings of Battersea and Neighborhood, some of the cleverest "arrangements" in black and white he has ever made.

We have thus tried to give some idea of the leading attractions of this most interesting exhibition. Sir Coutts Lindsay deserves the grateful thanks of all lovers of art for the rich treat he annually provides for them, the warmest support and best wishes for future success and permanence of the most promising addition which has been made to the art galleries of the metropolis for years past, in the hope that whatever difference of opinion there may be regarding individual works therein exhibited, the result may prove a great and lasting contribution to the art progress of our time.

THE AQUEDUCT OF SEGOVIA.

SEGOVIA is an unmatched picture of the Middle Ages, with its domes and belfries of what are here called "Byzantine" churches, the bare and blank forbidding walls of its deserted monasteries, the battlemented towers of its noble mansions; the strange contrast between the high, open terraces of its palaces and the low, flat roofs of its mean hovels; the medley of half-finished or more than half-ruined buildings, the houses propped up here and there by beams across the way, the edifices begun with means out of proportion with the ends; gigantic plans often leading to puny, dwarfish execution; broad streets and open squares terminating in narrow lanes and blind alleys; massive iron-sheeted doors, window-bars, and loop-holes in the walls betokening the long habit and necessity of individual defence; the very knockers at the doors fit specimens for a museum, and the dust of long decay, of neglect, of hopeless sloth, of lingering death, pervading everything, and lying already too thick and heavy to allow the doomed place the chance of recovery or even of the indefinite prolongation of its agony.

Though Spain musters many of these spectral cities, — though Toledo, Cordova, Ronda, and others are, if not dead, at least living the life of other days, — there is something in Segovia, more than anywhere else in Spain, that reminds the traveller of the aspect of the decayed cities of Italy, say of the havoc and splendor of Ferrara, Ravenna, or any of those of the Æmilia and Tuscany; for at Segovia few are the vestiges of the Moorish domination, and the monuments, for the most part, belong either to Roman or Gothic times, or rose in that golden age in which conquest brought Spain into incessant intercourse with Italy, and the victorious nation caught from the contact a little of the constructive genius of the vanquished people.

I could not hope to convey any distinct idea to the reader of the magnificence of the Segovia aqueduct by the statement borrowed from a very able monograph on the subject by Don Andrès Gomez de Somorrostro, to the effect that the water of the Fuenfria, running through the Rio Frio, was brought to it from the Guadarrama Mountains, over a distance of 10 or 11 miles, and that the aqueduct was made to go through several bends and turnings, to check the impetuosity of the stream, running 216 feet to the first angle, 462 feet to the second, and 937 feet to the third, where it becomes a bridge spanning the valley from bank to bank, and resting at the end on the solid rock on which stands what is left of the battlemented walls of the town. The total length of the aqueduct is thus 1,615 feet, and consists of 320 arches, which begin single and low, but rise gradually as the ground sinks, to maintain the level, and become double, one tier over another, as they vault over the gap of the valley, over the stream and the highway, all along the range that faces the traveller as he approaches to and passes under it, entering the town. The three central arches are the loftiest, and rise to a height of 102 feet. These are in the nether tier surmounted by three layers of stone somewhat in the shape of a step, intended as a cornice to mark the locality of the town-gate, and over the step in one of the pillars of the upper tier are scooped two niches, with a statue of the Virgin in the niche looking to the town, and in the other at the back a nondescript figure that priests call St. Sebastian, but in which the Segovians fancy they behold the effigy of the Satanic architect of the bridge.

No words and no picture could convey the impression wrought upon the traveller by the sight of this magic building. The whole structure is of granite, light gray as found in the quarry, but turned by age to a light pearl and purple tint, glowing like jasper in the deep blue of the semi-Alpine Castilian sky. The blocks of stone on a near inspection seem to have been laid upon one another clumsily and, as it were, at hap-hazard, some of them so daringly jetting out and hanging over as to suggest the apprehension that the whole fabric may at any time collapse and slip down to the ground like a castle of cards. Yet the bridge has been standing perhaps 2,000 years, and looks intact; and the design, seen at a proper distance, is a model of ease and elegance, relying, one would say, on mere symmetry and balance for solidity. The stones, rudely cut in large long square blocks, bear the holes of the iron clamps by which they were hoisted up to their places. They are worn smooth and almost round by time and storms, but sound at the core, and at the base of the pillars, as well as at various stages up the shafts and at the turning of the arches, there are cornices of what seems to have been black marble, but now everywhere chipped and cracked, and almost altogether fretted away.

The aqueduct is the only thing really living in poor dead Segovia; the necessity of securing a constant supply of better water than what flows between the ravines of the Erosma compelled the construction of this work when the place was a mighty city, and insured its preser-

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vation as the town sank year by year to its present forlorn and dilapidated condition. The Moors, who sacked the town in 1071, pulled down thirty-five of the minor arches, but the water-course continued uninterrupted, the people contriving by wood-work to prop up the wooden trough or pipe running at the top. The dismantled arches were restored as much as was practicable in the original style in 1483, by Queen Isabella the Catholic, and the aqueduct has suffered no outrage from that time. What is more properly called the bridge — the double range of arches across the valley — escaped even the ravages of the Arab invasion.

There is something exalting and flattering to human pride in the contemplation of this edifice, which, like the Pantheon at Rome, is between fifteen and twenty centuries old, and yet not a ruin. One dreams of the works of men that have risen and fallen in the adjoining city while the aqueduct has been standing and performing the humble yet vital service for which it was intended, unmoved by the joys or woes of the population to whose most pressing wants it ministered. The ancient cathedral, begun, it is said, in the sixth century, finished in the twelfth, where councils were held and kings were crowned, used as a fortress against ruthless enemies, and so ravaged that its Holy of Holies had to be removed to the spot where the present edifice rose in 1525; the Alcazar, till 1866 a masterpiece of royal magnificence, now a mere wreck destined to moulder on the ground to the end of time; the scores of churches and convents, sanctuaries, chapels, and hermitages, crowding the streets of the town and its suburbs, some of the Lord's houses now closed from want of worshippers, some of the fat fraternities dwindling in numbers and thinning in flesh as if, if not the faith, at least the lavish charity of their patrons cooled and fainted; the fortress palaces, where proud nobles learned valor and courtesy, then sulked and idled, and laid aside the energies and spirits which made them the bulwark and the scourge of their meaner countrymen — all that made Segovia in the Middle Ages and unmade it in modern times — had its rise and fall, its life and death, during the long period since the aqueduct first threw the shadow of its aerial arches on the skirts of the rock on which the city stands. Mighty Castilian kings, with their hosts of iron-clad warriors; the sweet and pious and thrifty Isabella on her palfrey with her crafty Aragonese husband and her cardinal minister by her side; the popular heroes, the rebels Padilla and Juan Bravo; the sallow and gloomy Philip II., and, perhaps, Columbus and Cortez, and a host of minor notabilities, rode centuries after centuries under these arches. The record of great events — the long war against the Moors, the formation of the Spanish monarchy, the extinction of the people's liberties, the expulsion of the Jews, the revolt of the Comineros, the decline of the national character, the repeated French invasions, and the revindication of the country's soil from the hated foreigner — all seem engraved on those slowly yet eternally crumbling stones, piled up by the constructive genius of a man who will be forever nameless. Those swarms of swallows and martins which hover on the wing in clouds about the lovely fabric, the shrieks of which are almost the only sound enlivening the air in the stillness of the summer sunset, have been there — they or their progenitors — ever since those arches were first bowed. The clay of their nests, hardened by ages, has clung to those stones since they were laid; generation after generation of these erratic birds have come back year by year from remote regions to their favorite haunts in those stones, and have found there undisturbed homes season after season. — *Correspondence of the London Times.*

THE VIBRATION OF MILL BUILDINGS.

Boston, September, 1879.

To the Editor of the American Architect:

Dear Sir, — Assuming that a large factory, or machine-shop, is to be constructed upon the slow-burning principle, with open timbers, plank floors, deck roof, etc., there remain other points to be considered, which do not appear to have yet received sufficient attention from either the mill-engineer, the professional architect, or the builder.

In many of the existing mills, even of apparently the best construction, there is a great tendency to vibration, and in some of the mills that are high and narrow the vibration is very great. When it is considered that the lateral motion which constitutes this vibration has been imparted to the whole structure, and that it causes a pressure of every bearing in the mill, first on one side and then on the other, it will be obvious that a great deal of power must be wasted, not only to induce this motion, but also to overcome the additional friction caused by it, especially in heavy bearings.

If the common method of constructing a factory be considered, its faults may be apparent, and possibly the remedy. Assume an ordinary mill, 350 to 500 feet by 72 feet, four or five stories high, with towers to brace the centre only; throughout the greater part of the length the section showing two rows of posts and two side walls, with no brace whatever to prevent them from yielding or bending in some degree either way. There are mills within our knowledge in which a pail of water two thirds full cannot be set upon the upper floor without slopping over; others in which gas pendants will sway from side to side more than two inches. One mill was lately inspected, of unusually good construction, built of stone, with arched brick floors, four stories high, carrying very heavy machinery for working flax; on the first floor of the mill it was observed that the gas pendants hung from the second floor had a very marked swing from side to side. We have the record of another large mill construction with iron beams, in which, before the machinery could be operated with any success, it became necessary to put wooden beams under the iron, and to lift the iron from the brick walls so that all the bearings should come upon the wood.

This vibration has been attributed chiefly to the motion of the looms, and it is now customary to place looms across the mill, and not lengthwise, and also upon a lower floor, as far as possible. In some cases one half the looms are operated at a little lower speed than the other half, in order to avoid a synchronous movement of the lathes; but there are many other causes of vibration, even in the rotary motions of other machines, and of the shafting, pulleys, and belts. Wherever there is friction there is a cause of vibration, and when it is necessary to construct a mill or work-shop above one story in height a remedy must be sought in the method of construction.

Mill construction appears to have been considered more with reference to the support of dead weight than to stiffness or absence of vibration. In point of fact, the dead weight to be sustained in a cotton or woollen mill is very little. If we take as an example a mill of 32,000 cotton spindles on No. 24 yarn, the floor space and dead weight of the machinery, omitting openers and pickers, which would, almost as a matter of course, be placed upon a concrete floor in a separate building, would be substantially as follows: —

COMPUTATION FOR A COTTON MILL OF 32,000 SPINDLES.
No. 24 Yarn.

	Pounds, about.	Total.	Stock.	Shafting.	Operatives.	Total Weight.	Floor Space.	Average Weights.
6 Lappers.	12,000	72,000	280	13,000	300	85,580	In sep. build'g.	
240 36-inch Cards.	1,600	384,000	4,800	11,920	275	400,995	17,856	23.30
2 Doublers.	380	1,360	40	1,100		2,100		
12 R. W. Heads.	800	9,600		1,100	180	10,880		
21 Drawing.	2,000	42,000	850	1,250	180	44,280	5,184	8.52
36 Roving Frames.	9,000	324,000	2,000	14,500	4,300	344,800	12,528	27.53
90 Spinning Frames, 176 Spindles each.	4,000	360,000	15,340	125,000	1,820	502,160	15,984	31.42
24 Mules, 672 Sps. each.	10,000	240,000	16,000	21,000	2,800	282,800	24,192	11.69
8 Spoolers.	2,600	20,800	800	3,000	825	25,515	5,184	6.15
6 Warpers.	450	2,700	760	410	500	4,370		
2 Slashers.		4,000	5,000	2,200	480	12,280	5,760	26.66
8 Drawing-in Frames.	60	480	1,000		1,000	3,080		
800 Looms.	800	640,000	128,000	140,000	16,000	924,000	36,864	25.07
		2,020,540	175,880	326,480	28,360	2,560,260	123,552	20.72
	Add for contingencies 20 per cent.					512,052		
						3,072,302		24.86

The greatest concentration of weight is immediately under the slashers, and as the floor reserved around the slashers is used to pile loaded yarn-beams upon, the weight at this point is relatively much more than the figures show.

A mill floor constructed in the usual manner would consist of beams 12 by 14 inches in one or two parts, eight feet on centres, 3-inch plank, 1¼-inch top floor. The material would usually be hard pine and spruce; this would be substantially equivalent to six inches of wood of uniform thickness. Spruce weighs thirty pounds per cubic foot; Georgia pine forty-eight pounds. On these figures the floor described would be equal to 19½ pounds weight to each superficial foot of floor surface. If ⅝-inch mortar were used between the floors, it would add about six pounds per square foot, — making 25½ pounds in all. The total weight of floor and load is, therefore, from fifty to sixty pounds per foot of surface in the principal departments of the mill. If the load be multiplied by eight the standard of the beams would be to bear a breaking strain of 250 pounds per foot of surface, or 50,000 pounds on each beam twenty-five feet long, supporting four feet of floor on each side of the centre, — 200 square feet per beam. (An actual weight equal to this was lately found in a warehouse used for storing cheese.) The weight of the floor itself would be distributed about in the proportion of seven pounds in the beams, and 12½ pounds in the plank and boards of the floor. These figures would be varied a little, according to the kind of timber and plank used. In a mill seventy-two feet wide in the clear, with two rows of posts, the beams must each be a little more than twenty-four feet long; and it is obvious that there must be a very great proportionate weight on the centre of each beam, and therefore a tendency to sag in the middle. What that means, in respect to the adjustment of shafting and the operation of machinery, every manufacturer knows, to his cost and trouble.

How to stiffen the beams without exposing iron truss-rods, such as are commonly used, to the action of fire, as the combustion of the contents only of almost any room of a textile factory would heat truss-rods so as to make them useless, and would probably heat and destroy iron beams, would seem to be a suitable question.

The problem is how to get the strength of iron and the slow burning of a heavy wooden beam. Objections are made by some engineers to composite beams of iron and wood, and it is not desirable to reduce the substance of the wood more than one half, — that is, not to have either of the two parts of a beam much thinner or more combustible than the floor.

It is alleged that the weight upon a floor sustained by a composite or "flitch" beam will rest either on the iron or on the wood, and

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cannot be brought upon both together. If your correspondents have any data upon this point, it would be interesting to the mill constructors to know them.

It has been suggested that a factory may be braced with inside rods, but it is desirable to avoid rods because of their tendency to collect lint.

The equivalent of the knees used in the construction of a ship has been suggested, but it is desirable *not* to tie the beams to the walls, so as to prevent the ends rolling out of their bearings in case they break or burn one at a time.

Buttresses would doubtless serve a good purpose, but they are somewhat objectionable if deep enough to obstruct light in the lower stories.

Our problem, therefore, is how to construct the walls, either solid or hollow; how to brace the posts; and how to construct the beams so as to give the utmost stiffness and so as to avoid vibration.

There are problems not yet solved in respect to the construction of the frames of machinery, as well as of the mills, that would, perhaps, repay scientific study with a view to avoiding vibration, — a familiar example of the unscientific use of material being the original use of stone sleepers on the Lowell Railroad.

The problem of rightly combining wood and metal in the framework of rapidly moving machinery, and wood, metal, brick, or stone in the construction of the factory, appears to offer a wide field for saving in power, friction, wear, and waste.

These points are stated as indicating some of the points that might be well considered by the student of *industrial architecture*, and every attempt at architectural effect must be absolutely subordinate to them. The only true effect that can be rightly aimed at must be that which gives expression to these considerations of safety and utility. E. A.

SLOW-BURNING CONSTRUCTION.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — I do not think that after all there is much difference of opinion between E. A. and yourself as to the proper relation of wood and plastering. That floors and shingles laid in mortar do not decay when the mortar is kept dry is a matter of every-day experience ; that they do rapidly decay when the mortar is damp is also well known.

The only requisite in such constructions is care to avoid moisture. The coating of timber with plastering on lath would, if the mortar were mixed with hair, I think, inevitably leave small interstices, the air in which would be changed by diffusion through the plaster, if dry, at any variation in temperature or condition of the atmosphere, and this may serve to oxidize the dry-rot spores, or in other ways check fermentation. If the mortar were damp, it would, however, be as impervious to air as a sheet of iron, to say nothing of the liability to set up decomposition in the timber by liquefying the albumen contained in it, so that, as before, caution is needful in applying such processes. Whether there would be any such transpiration if there were no appreciable interstices between the wood and the mortar is doubtful, but with the evidence we have, it must still be regarded as hazardous, even in our dry climate, to coat the wood closely. Why cannot some student of technology investigate the subject? The dry-rot *mycelium* can be obtained from most old buildings, or in any forest, and the behavior of a few sticks of marketable lumber, slightly inoculated, under different circumstances, would be a most useful study.

Has E. A. any definite observations on the comparative value of plaster of Paris and common lime for plastering mortar to be exposed to fire? It is commonly thought among architects that the gypsum, where the extra cost can be afforded, is much the best material. Not only is the hydrated sulphate of lime one of the slowest known conductors of heat, but it remains solid after being strongly heated and then quenched with water, while lime under such treatment slakes and crumbles. The underwriters should know best about such matters, and we shall be glad of any new light.

I think that E. A.'s account of the spreading of a certain fire between the furring strips on a party-wall will serve as a text for a protest against his depreciation of the building laws, — the work of the architects. In New York, as I presume he knows, party-walls, or interior walls of any kind, are very rarely furred, not that the architects there understand their business any better than here, but because their greater energy has there caused the enactment of a very strict building law, which by demanding twelve inches space between any woodwork and the inside of a flue has made furring on the flue walls, which are of course the party-walls, generally impracticable. That this is a great protection against fire is evident, but it is the cause also of unavoidable cracks in the plastering where any stud partition meets the plastered brick wall, on account of the settlement of the masonry ; and Boston builders and owners, so far as my experience goes, always prefer the superior neatness of a room all whose walls are lathed on furrings or studs, and will probably continue to do so, so long as the insurance companies are willing to bear for them the burden of the additional risk from fire, unless public opinion can be brought to permit the passage of a building act similar to that of New York.

I have seen so many instances of the good accomplished by building laws, the support which they give to architects in their attempts at better construction, and the struggles of owners to evade them, that I should be sorry to think that E. A.'s influence would be given against them, and trust that he will interest himself to inquire more closely into their operation.

With regard to his opinion that " it can hardly be that the owners of property who are so willing to spend large sums for architectural effect should be unwilling to consider the suggestions made by architects for greater safety " I must continue to differ *toto cœlo*. I am reluctant to cite examples from personal knowledge, but any architect can supply them. Perhaps a little *ad hominem* argument may put the matter in a new light, and to supply one, I will cast off my professional robes and appear in the rôle of a private citizen.

I have at present an interest in the insurance on fifteen buildings, connected with a property which is intrusted to my care. In the management of the property, my knowledge of the principles of slow-burning construction, such as it is, often shows me serious defects in the design and execution of the buildings, such as I should probably have corrected at once if they belonged to me, purely from the desire of gratifying my personal sentiment in favor of good construction. I sometimes find myself imagining what might be done to preserve them from danger of fire, and am obliged to check such thoughts with the question, " Have I a right to do such things with trust property? " As I understand it, my duty is to conduct the estate so that the capital invested shall yield a regular and permanent income, as large as may be without risking subsequent diminution from deterioration of the property. To this end I endeavor to make the buildings durable, tight, strong, and wholesome ; to secure and keep good tenants by avoiding dampness or sanitary defects, to provide against loss by tempest or decay, but from loss by fire I look to the underwriters to protect me. It is needless to say that I have nothing to do with mutual companies, and the stock companies pay no attention to the details of construction in fixing their rates, so that, while I have spent without hesitation a third of the valuation of a house in making it clean, dry, wholesome, and attractive, I have not spent, and shall not spend, for security against fire one dollar beyond the insurance premiums, until I find that the income from the estate will be increased thereby, or the rate of insurance diminished. If any safe company will make it for the interest of the property to render the construction more secure against fire, I will promise that all my insurance, and all that I can influence, shall be taken in that company, and will at once invest a capital in remodelling the buildings I may have in my care proportionate to the income saved, and, if I build new, will spend a similar sum in making a slow-burning construction attractive to tenants ; but until then I consider it my duty to go on in the old way, which universal custom proves to be the best adapted to the purpose I require it for. Does E. A. think I am wrong? Would not he, or any other prudent man, do the same ? And if this is justifiable on the part of the owners, how can it possibly be the duty of the architects whom they employ to oppose them ? I should be glad of strict building laws, which would uphold me in gratifying my sentiment for good construction, as well as my conception of the proper relation of the members of society in general to each other, but such considerations are out of the question in this case. My duty is plain : to derive the greatest permanent income from the estate, with the least amount of expenditure. If I think that exterior or interior decoration will attract tenants, so as to pay good interest on its cost, I shall have it put on, and shall employ the architect who can design it most to my mind ; but the one who works in the interest of the insurance companies, instead of mine, and sacrifices what I consider beauty, convenience, or economy to safety *from fire*, will receive from me in my capacity as trustee little encouragement, however my professional sympathies may incline ; and I am much mistaken if that is not the attitude, and reasonably so, of owners generally, and the architects must follow their wishes. If the insurance companies cannot change their course, there is but one resource, — legislative interference. That has already accomplished much, and can do much more. The architects know this, and have struggled hard, against their own interests to a great extent, to promote the enactment of building laws, while the underwriters, whose permanent interest is certainly in favor of diminishing the risk of fire by all possible means, have done little or nothing. They are rich and powerful, and it seems to me that they have a public duty to perform. Already they are openly accused of profiting by fires, and of encouraging dangerous constructions, which enable them to increase their rates on good risks, and so long as this is even partly true, the architects cannot be expected to contend alone against them. It will not be long before the public will discover that in the end it pays, not only all the losses by fire, but half as much more besides, to support the insurance officers and their clerks, and will demand a reform, by which those who build properly may secure for themselves a small portion of the great benefit which they confer upon the community at large. If the competition of insurance companies cannot effect this, strict building laws will, and whichever way is adopted, the architects will be found ready and eager to help.

C.

NOTES AND CLIPPINGS.

THE MANCHESTER SOLDIERS' MONUMENT. — We are requested by the architect of the Soldiers' Monument, at Manchester, to say that the contractors for the whole work were Messrs. Frederick & Field, of Quincy, Mass.

THE LONDON OPERA-HOUSE. — The *Pall Mall Gazette* states that the work of building the new opera-house on the Thames Embankment is to be recommenced by a stock company, based on the tontine principle, shares being held at one hundred pounds each.

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A Party-Wall Quarrel. — Mr. James M. Glenn, a citizen of Cincinnati, O., decided the other day to tear down an ancient and time-worn building at the corner of Fifth Street and Race Street, and replace it by a more substantial and modern edifice. The work of demolition was carried on without hindrance or delay until it came to tearing down the party-wall on the south, which separated the premises of Mr. Glenn from those of Mr. Cozard. Mr. Cozard protested against having the side of his house taken away, leaving his halls and stairways exposed to the wind and rain. Mr. Glenn was sorry, but could not help it, the wall stood, according to his survey, ten inches on his ground, and must come down; Mr. Cozard, armed with a survey as good as that of Mr. Glenn, which said the wall was not on the Glenn property, and likewise armed with advice from his lawyer, declared the wall should not come down. Notwithstanding this declaration, Mr. Glenn put up his scaffolding, and his workmen with pick and shovel made a vigorous assault upon the wall, and were only prevented from carrying out their designs by the timely appearance of the Cozard party on their building, armed with double-barrelled shot-guns. Mr. Glenn being opposed to the shot-gun policy, and thinking discretion the better part of valor, called the law to his aid, and the Cozards were arrested, and while they behind the bars of a police station awaited bail, the Glenn party again assaulted the wall, which was down by the time the Cozards were liberated.

A New Catholic Church at Rome. — A correspondent at Rome, writing on the 18th ult., says: Rather a novel sight, the laying of the foundation-stone of a new Roman Catholic church, was witnessed in Rome a few days ago. Except for the church built by Father Douglas behind S. Maria Maggiore, it must be some hundreds of years since a church foundation-stone was laid in Rome, — *i. e.*, of the Roman faith; for many churches of other denominations have sprung up since 1870. Although Rome has already 300 churches, there is some reason for this new one, for all the churches of Rome are built in the old town — the only occupied part until the Italians came in; and so the new districts which have sprung up, especially the one beyond the railway station, Maccao, as it is called, find themselves a long way from any church. This new church is just in that district, a little way down the road leading to S. Lorenzo, and facing the railway station. The architect is Signor Vespignani, and, judging from the plan traced on the ground, it will be of the basilica shape, but decidedly small. It is to be dedicated to the "Sacred Heart," and it was at one time announced as the only church in Rome with that dedication. It was to be a huge temple, raised by subscription throughout the world. Perhaps the subscriptions fell short, though a part of the inscription above the inaugural pavilion yesterday says that it is erected "*munificentiâ Leonis XIII. et cultorum stipe.*" — *Pall Mall Gazette.*

The Alhambra. — It should be put on record that the rumors concerning the probable partial destruction of the Alhambra, which we mentioned some time since, are proved to be without foundation in fact. The reports grew out of the endeavor of certain persons in Granada, who saw a chance to profit by such a job, to induce the Government to build a great retaining wall in a hollow of the Alhambra hill, which Señor Contreras, the architect in charge of the palace, and the government engineers, declared to be entirely unnecessary.

Antwerp Cathedral. — The Paris *Figaro* of late date states that the open-work about the tower of the Antwerp Cathedral is in such ruinous condition as to threaten the passers-by.

Staining Pine. — The *Northwestern Lumberman* recommends the following manner of staining pine to represent black walnut: Put pulverized asphaltum into a bowl with about twice its bulk of turpentine and set where it is warm, shaking from time to time until dissolved; then strain and apply with either a cloth or a stiff brush. Try a little first, and if the stain be too dark, thin it with turpentine. If desirable to bring out the grain still more, give a coat of boiled oil and turpentine. When the wood is thoroughly dry, polish with a mixture of two parts shellac varnish and one part boiled oil. Apply by putting a few drops at a time on a cloth and rubbing briskly over the wood.

The Maison du Roi, Brussels. — The rebuilding of the Maison du Roi, or Halle au Pain, at Brussels, offers a very curious instance of architectural perversion on the part of some one. Built in the sixteenth century (1514–25), in a transitional style, part Gothic, part Renaissance, it was replaced in 1767 by a building which was admitted to be in egregiously bad taste. This eighteenth century building has been pulled down and the restorationists, say rather resurrectionists, are attempting to replace the sixteenth century building, their data being such traces of the old foundation walls as they can discover, and a painting in the museum which shows a procession passing through the Grande Place. The façade shown in this picture is said to be such that few would care to see it reproduced in stone and mortar.

A Semper Museum. — The admirers of the late Gottfried Semper propose to found in his honor at Zurich, after the manner of the Schinkel Museum at Berlin, an architectural musuem into which shall be gathered all the drawings, designs, and models of the master's work that can be obtained.

An Errant Hour-Hand. — The *Evening News and Star*, of Glasgow, tells the following story: "The other night Mr. Walter Hastings, manager of Mr. Osmond Tearle's theatrical company, and Mr. Hamilton Nimme, music-seller, were coming up Bridge Street, Ayr, about eleven o'clock, when, just under the town's spire, the first-named gentleman happened to ask what time it might be. He had scarcely uttered the words when something descending struck him with considerable force on the head. One side of his hat was completely smashed, but beyond a rather rude shock the owner sustained no personal injury. The missile, on being picked up, proved to be the hour-hand of the New Bridge Street dial of the town's clock. It looked a formidable enough weapon, being twenty-eight inches long, three broad, and was about two pounds weight, and had descended about ninety feet. The rough weather had detached it."

The Hamathite Inscription. — One of the most remarkable objects of antiquity obtained from Asia since the Assyrian sculptures, says the London *Athenæum*, is the Hamathite inscription which has just been placed in the Oriental Gallery of the British Museum. It is composed of dark basalt, about four feet high, and probably formed part of a doorway. On it are five horizontal lines of an as yet unknown character, undoubtedly resembling in some peculiarities the Egyptian, but so distantly connected with this now well-known language that as yet no approach has been made towards its decipherment. The inscription is manifestly boustrophedon, and probably reads from top to bottom. The characters are raised by sinking the field of the inscribed lines about three eighths of an inch. They consist of animals' heads, human hands, feet, birds, a figure resembling an O, trees, crooks, crocodiles (?), yokes, thrones, or carved chairs (?), and short lines or a line between two squares, these latter probably being numbers. From certain groups recurring with variants, there is probably some grammatical system underlying the arrangement of characters, which, nevertheless, partake strongly of the pictorial and ideographic element. The Rev. Dunbar I. Heath, whose labors upon the Egyptian language are well known, is assiduously studying the inscriptions, of which several are now extant. We hope he may succeed in finding the key to the mystery.

Flaxman's Bas-Reliefs. — The *Scotsman* says that the three bas-reliefs which were executed by Flaxman at the time he was admitted to the Royal Academy have been presented to the Swedenborgian church at Kensington.

Artistic Copyright. — A novel question of artistic copyright has recently been decided in France. The heirs of three great painters — Paul Delaroche, Horace Vernet, and Ary Scheffer — brought a joint action against the publishing firm of Goupil to restrain the reproduction and sale of works of those masters on the ground that the extension of time granted by the law of 1854 inured only to the benefit of the representatives of the painter. The Minister of Fine Arts intervened in the suit, to watch the interests of the nation. In July, 1878, the Court of First Instance decided adversely to the plaintiffs, but this decision has been reversed on appeal. According to the judgment Messrs. Goupil have an absolute property in the original paintings; but, after the lapse of ten years from the death of the painters, the right of reproduction reverted to their heirs. It was, therefore, ordered that the defendants should pay a royalty to the plaintiffs on account of copies sold since that date, the amount to be determined by an expert. — *Exchange.*

The Ming Mausoleum near Nanking. — A correspondent of the *Celestial Empire* says: "Foremost among the numerous relics of antiquity in which this city is so rich, stands the mausoleum of the Emperor Hung Wu, founder of the dynasty of Ming. The place is commonly spoken of as the 'Ming Tombs' — a phrase palpably erroneous, seeing that there is but a single grave, although this is certainly large enough to include at least a dozen ordinary cemeteries. Five hundred years have rolled away since the quondam temple-servant, after heading a patriotic rebellion against the power of the Yuens, and rising to be monarch of the flowery land, was buried in this quaint, wild spot. As it lies some distance from the town, we elect to go on horseback. At the foot of the mountain is a small, regularly shaped hillock, girded by what looks like a white necklace with a clasp in front. Then we know that we stand before the emperor's tomb. Entering by a tumble-down portico, the coarse and tawdry red paint of which forms an unpleasant contrast to the solid masonry around, we find ourselves in a huge double quadrangle, strewed with ruins and overgrown with grass. Before us rises a broad, massive, and beautifully carved flight of shelving steps, on the top of which is a large stone platform, covered with the remains of monuments all in ponderous stone, signs of real splendor of material, of workmanship, and of design. A lofty screen or tablet occupies the central position, from which we descend upon the other side, and walk along the second quadrangle, until we reach the mausoleum proper. The ruins here are not abundant, but there is the same appearance of massive grandeur as in the first division. At length we come to a high temple-like building through which runs, upward, a long stone tunnel, at the other end of which we find ourselves at the foot of the hillock and almost on a level with a temple floor. Of course the temple is a ruin, like everything else, but it is the very reverse of imposing, being clumsy, flimsy, and painted a vile red. And then comes the finishing task — the ascent of the hillock behind. This pretty little elevation is surrounded by a wall — the necklace before referred to, while the red portico and temple form the locket. Our trouble is well repaid by the splendid prospect from the top, and the marvellously distinct echo which is produced by the faintest sound of the voice. We go back by way of the avenue. This is a long double line of colossal figures leading from the principal entrance of the mausoleum to two large structures, a good half-mile distant: one an enormous gate, the other a sort of funeral hall called the Hsuän Kung, or sombre palace. The first statues in the avenue are a couple of gigantic civil mandarins — grand officers of the household. Then come two couples of stalwart warriors, heavily armed, and clad in fine chain mail; after which we have a pair of carved and decorated pillars. Then begin the animals — as strange a procession as ever emerged from Noah's ark: two pairs of horses, two of dogs, two of tortoises, two of elephants, — such gigantic creatures, — two of camels, two of the mysterious *k'i-lin*, two of lions, and a great many more which I would not venture to define, being like nothing that anybody ever saw since natural history became a science."

The Sarcophagus of the King of Sidon. — A singular fact is noted in connection with the sarcophagus of Ashmenezer, King of Sidon, now deposited at the Louvre, the inscription of which has just been deciphered. It is in effect like that of Shakespeare's tomb, uttering a curse upon whosoever should remove the monarch's bones. It further declares that such robbers shall leave no descendants, but shall be driven from their country. The Duc de Luynes bought the sarcophagus; he and his only son were killed in the Papal war of 1859. Again, Napoleon III. brought it to Paris and deposited it in the Louvre; he died and was buried in a foreign land, and his only son died at the hands of savages in a strange country. There is not a descendant left of Napoleon III. or of the Duc de Luynes. — *Exchange.*

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IN the death of M. Viollet-le-Duc, which is just reported, the profession of architecture suffers perhaps the severest loss that has befallen it in modern times. Not that there had not been greater architects, for neither in design nor in construction did he stand among the first, but by his persistent advocacy of rational design, and his convincing analyses of the architecture both of antiquity and of the Middle Ages as the expressions and necessary consequence of certain systems of construction, in distinction from the sentimental or symbolical aspect under which they presented themselves to earlier critics, he has exerted an influence which few in our day have attained in any art. Even the enthusiasm excited by the moving eloquence of Ruskin seems to have been transitory compared with the energetic crusade which has been carried on during the last twenty years against sham and pretence in design of all kinds, for which the works of Viollet-le-Duc have served both as moral inspiration against yielding to the temptations of a vicious style, and material resource for the formation of a better one. His task has been accomplished; the doctrines he inculcated are now accepted as a part of the best professional thought, and to the treasure of examples which he labored so long to collect for us, new treasures are daily added, but the knowledge that the living presence of the teacher is gone forever from among us will cause a sense of personal loss to thousands who have known him only through his writings.

EUGENE EMMANUEL VIOLLET-LE-DUC was born January 17, 1814. He studied architecture under Achille Leclerc, and in 1836 went to Italy. After two years among the Roman and Greek remains of Italy and Magna Græcia he returned to France, continuing his researches in the southern provinces of his own country. In 1840 he was appointed to the comparatively humble position of *inspecteur des travaux* under Duban at the Sainte Chapelle. Before this work was finished he was sent to take charge of the restoration of the abbey church of Vezelay, and, in the following year, of the churches of St. Père, Poissy, Montréale, St. Nazaire de Carcassonne, and Semur-en-Auxois, and the hotels-de-ville of St. Antonin and Narbonne. In 1848 he was chosen in competition as adjunct with Lassus to direct the repairs of Notre Dame and the construction of the new sacristy; and this work was followed by the restorations of the fortifications at Carcassonne, the Salle Synodale at Sens, the cathedrals of Amiens and Laon, and the church of Châlons-sur-Marne, and later, the castles of Pierrefonds and Coucy. In 1853 he was made one of the three *inspecteurs des monuments historiques*. He was an officer of the Legion of Honor, and honorary member of both the British and the American Institutes of Architects. On the reorganization, in 1863, of the École des Beaux-Arts, which he had often taken occasion to criticise in his writings for what he considered to be its devotion to irrational and unscientific principles of design, he was appointed professor. This aroused the resentment of the students, and a demonstration took place, which, though it ended in nothing, perhaps led to his retirement not long after. He was afterwards identified with the École Centrale, which gave instruction in architecture in a manner more consonant with his predilections. In 1870–71 he was put in charge of certain of the defences of Paris, with the rank of colonel. Since then he has lived a retired though busy life, much of the time in Switzerland, devoting himself to the writing of essays and newspaper articles, together th more important literary undertakings.

HIS *magnum opus*, the fruit of immense labor, is the well-known *Dictionnaire Raisonné de l'Architecture Française du XI^e au XVI^e Siècle*, embracing the observations and deductions gathered during the whole period of his active life, from his earliest years to 1868, when the last volume was published, and illustrated by more than three thousand sketches, all drawn on the block by his own hand. This was followed by the *Dictionnaire du Mobilier Français de l'Époque Carlovingienne à la Renaissance*. In 1854 appeared an *Essai sur l'Architecture Militaire du Moyen-age*, substantially a *résumé* of the observations on the subject scattered through the volumes of the *Dictionnaire*. The *Entretiens sur l'Architecture*, the last volume of which appeared in 1872, comprise a series of discourses, historical and theoretical, and form his last strictly technical work. Since then, his lively and entertaining style has found congenial expression in a number of semi-scientific novelettes, the best of which is the *Histoire d'une Forteresse*, published in 1874. Similar to this are the *Histoire d'une Maison*, and *Histoire de l'Habitation Humaine*, published in 1873 and 1875. A more serious work, the *Habitations Modernes*, written in conjunction with M. Félix Narjoux, has just appeared. The professional journals owe to him many contributions. His *Lettres sur la Sicile* have been reprinted in book form, and a monograph on certain geological features of Switzerland was published not long ago. As an architect, in the sense of designer, Viollet-le-Duc's name does not stand high. His constant employment in other branches of the profession, his temperament, naturally logical and scientific rather than æsthetic, and the deep impression made upon his mind by the constant study of actual examples, all conspired to check what power of original design might have been developed under different auspices; and yet as an artist his reputation was more extended. He received three medals for serious works in water-color, and the sketches with which his works are filled, hasty and mannered as they are, show a vigor of drawing and knowledge of effect which would be even more striking if it were not overshadowed by their extraordinary merit as the best architectural illustrations ever published.

IN a project which has in one form or other been long before the people of Paris, and has of late been the subject of discussion both in the municipal council and in the ministry of the fine arts, — the project for establishing a national opera, that is, a popular one, — M. Viollet-le-Duc has taken a warm interest, as he has in every question of opening art to the active influences of the day. He has lately presented a report or memorial on this subject to the municipal council. He argued for a stage which shall give adequate representations of the best works without the costly mounting of the fashionable opera or other theatres, and a low admission price. This, he thought, would divert many people from their attendance on the *café* concerts and the lower theatres; and he argued that the public, which would be contented with good works well executed, would not be exacting of splendor in the *mise en scène*. This will seem not impossible to the visitor who remembers the crowds that have for years attended the excellent but unpretentious Pasdeloup concerts, and who recollects that at the theatre of the Odéon in the Latin Quarter, which may, we suppose, be called *par eminence* a popular theatre, certain days in the week have always been set aside for the performance of serious and standard works, making it the only theatre in Paris, except the Français, where one could always find chances to hear the best French plays. His latest published writings are a series of papers printed in *L'Art*, on Decoration applied to Buildings, a subject which he has studied by the lessons of earlier and more homogeneous examples than those of to-day. In these papers, of which the last, apparently, was printed hardly a month before his death, he writes with all his accustomed keenness of analysis and breadth of view, and he does not fail to lift his voice as usual against the academic exclusiveness and conservatism which it was one of the habits of his life to attack, nor to bear his testimony against their influence, which he had once in vain attempted to combat, upon the École des Beaux-Arts. He closes with this characteristic paragraph: "My conclusions shall not be lengthy. There are but two modes of existence for art: hieraticism and liberty. Hieraticism tends fatally towards irremediable decadence. Liberty may have its excesses, its moments of splendor and of eclipse; but however low it may fall it always springs up again with new youth and vigor."

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We have received a small *brochure*, which may be considered the prospectus of a private course of instruction in civil and mechanical engineering projected by Mr. William Watson, sometime professor in the Massachusetts Institute of Technology. The plan of instruction proposed in the brochure is to exchange the system of teaching by text-books, usual in American technical schools, for familiar lectures and the discipline of problems, or *projets*, as they are called in the French schools, combined with study in what the pamphlet calls a studio and *atelier*, which will be supplied with examples and models of appliances and constructions of engineering, both civil and mechanical. The method of instruction thus foreshadowed will be new in this country, although it is founded on the practice of the most successful continental schools. It ought to have special advantages in leading the engineering student directly to the study of the sort of problems which he will face in actual practice, under the inspiration of the best examples and under the immediate supervision of an instructor. The apparatus for teaching, which Professor Watson has collected and which the pamphlet enumerates, is extensive, and includes much that has not been introduced in this country, much, in fact, that is not accessible for the use of most schools, containing unpublished courses of the lectures delivered in the French schools; collections of the projects used in them; models, books, and illustrations of var ous kinds collected by the projector while studying the European systems of instruction, or while acting as U. S. Commissioner or member of the jury at the Austrian and French Exhibitions. The course of instruction promised includes the usual subjects, — descriptive geometry, stereotomy, the principles of mechanism and of constructive engineering. With these are included, of course, draughtsmanship, to which is added practice in modelling; and special stress is laid on the use of the new methods of graphical statics. Examples are given of the kind of problems to be studied in connection with the courses, *e. g.*, the iron roof of a railroad station, a travelling crane, the improvement of an inland and a tidal river. These methods of education are those that have been best approved by experience: we shall be glad to see them introduced in this country with adequate appliances and under skilled instruction.

It is a painful and wearying duty to chronicle week after week the fatal disasters that are due to the bad construction of buildings; but our habits of building are in some particulars so disastrous that public attention cannot be too persistently called to their consequences. The latest case we have heard of was the burning of a small tenement-house in South Boston, Mass., a few days ago, by which five persons were killed and several others greatly injured. It was a common kind of occurrence, — its significance is in its commonness, in fact. A fire at the foot of the staircase was discovered from without at midnight. When the alarm was given the egress of the lodgers on the upper floors was already cut off. The firemen, arriving with their ladders, found that those who were not burned alive had been either killed or maimed by jumping from the windows, or the roof, no one, we believe, escaping without injury. Fortunately, the house being a small one, there were only three families in the upper stories, and therefore not a great many people to burn. When we consider how the larger tenement-houses are built and occupied, the wonder grows that such occurrences are not more frequent and more disastrous. The weakest point is always the staircase, since it is not only the way of escape, but the speediest means of spreading the fire. The incendiaries at all events have found out this vulnerable point; and it is to one of them that the disaster at South Boston is ascribed.

Our hotels, it must be confessed, are not much better provided in this respect than our tenement-houses. When the Tremont Temple in Boston was burned a controversy was provoked between the *Fireman's Journal* and the proprietor of the Parker House, which adjoined the Temple, by some reflections of the paper on the risk to the guests at the hotel. The *Journal*, while allowing that the Parker House was as safe as other hotels, reasonably condemned the manner in which all hotels are built as unsafe. Its remedy — and it is the remedy which we are apt to hear first invoked, whenever a tenement-house or hotel or factory burns — was fire-escapes and balconies. Fire-escapes are no doubt valuable auxiliaries to staircases in case of fire, when they are not otherwise objectionable, and important palliatives of danger in buildings whose stairways are insecure and cannot or will not be improved by their owners. For many existing and faulty buildings they may be the only palliative which can be imposed. But we have small respect for them as substitutes for proper stairways, or for the wisdom of persons who will build staircases that invite fire, and then look to fire-escapes to do duty for them when they burn. The fire-escapes seem to us a very questionable addition to hotels, where their chief use would be, we fear, to afford an apparatus for playing bo-peep with thieves, and where the chief security is to be looked for in constant patrolling, and in proper planning and construction. In these last respects old buildings are often incurable, to be sure, but new ones may be provided for by law, and should be, now that public attention has been so often called to their danger. It is pretty safe to say, without computation, that the money which it would cost to properly equip any large tenement-house or hotel with fire-escapes would meet the additional cost of enough fire-proof staircases to do much better service. It is important, therefore, not to let the proposed palliation divert attention from the radical fault, which we ought to remedy. Already the agitation of the tenement-house problem has advanced us so far that all the plans for improved buildings of this class that are brought forward are provided with fire-proof stairs; and it ought to be forbidden henceforth to build in our large cities any hotels or tenement-houses that are not provided with a sufficient number of staircases that will not burn, enclosed in brick wells that will not communicate fire. Then let fire-escapes be added, when there is occasion for them, and where they will not invite as much danger as they parry. When this kind of construction becomes the rule, as it is in more carefully regulated towns than ours, the danger of casualties will be enormously diminished, and the "fire-bug" will be checkmated, at least in his most diabolical trick of kindling his fire at the bottom of the stairs.

Apropos of articles on the Venus of Milo which have appeared lately in the *Atlantic Monthly* and the *Art Amateur*, we have in the last named journal a letter from Mr. Philip Gay, which describes with interesting minuteness the manner in which the statue was hidden away by the curators of the Museum in the Louvre, as is commonly known, during the sieges of Paris in 1870. The Venus, laid in an iron coffin, was carried out by night and immured in a subterranean chamber at the end of a corridor in the Prefecture. A wall was built to enclose her, and finished with all the factitious look of age that it was possible to give it. In front of this a second chamber was walled off, being filled with a valuable deposit of state papers, which also needed a place of safety, and which were immured in their turn. It was shrewdly assumed that if the outer hiding-place were discovered the finding of an important deposit of documents would satisfy the discoverer, and that he would look no further, but leave the yet more precious deposit of sculpture undisturbed. In point of fact the Venus lay securely until the troubles of the Commune were over, and it was safe to restore the treasures of the Louvre to their places in the galleries. It will be remembered that to this removal we owe the correction of the attitude of the goddess, as far as her body is concerned. The statue was made in two or three pieces, which separated when it was taken down; when she was replaced it was noticed that to suit the taste of her first restorers the upper part of her body had been tilted forward by inserting wooden wedges into the joints in the back of the figure. The story of the concealment is pleasant testimony to the intelligence as well as the zeal of the custodians. It is unlucky that the publication of the device will make it more difficult to succeed in it when the need occurs again. But the trick may be forgotten in the lapse of a generation, as many things are forgotten.

URBAN HOUSING.[1] V.

In this plan for a bachelor apartment-house in New York, on a twenty-five by one hundred feet lot, not on a corner, a lot chosen because of the kind most common in New York, the architect has aimed —

First. To avoid inside and windowless rooms.

Second. To avoid windows opening on close courts, air-shafts or wells of light, or other objectionable or insufficient air and light spaces.

Third. To avoid inability to get a thorough draught of air through each dwelling in hot weather, or when needed for ventilation.

Fourth. To avoid (while securing the benefits of shallow houses as regards ventilation) wasting space in over-large yards, or neces-

[1] The paper on New York Yards (Vol. V., Nos. 178 and 179) forms part of this series.

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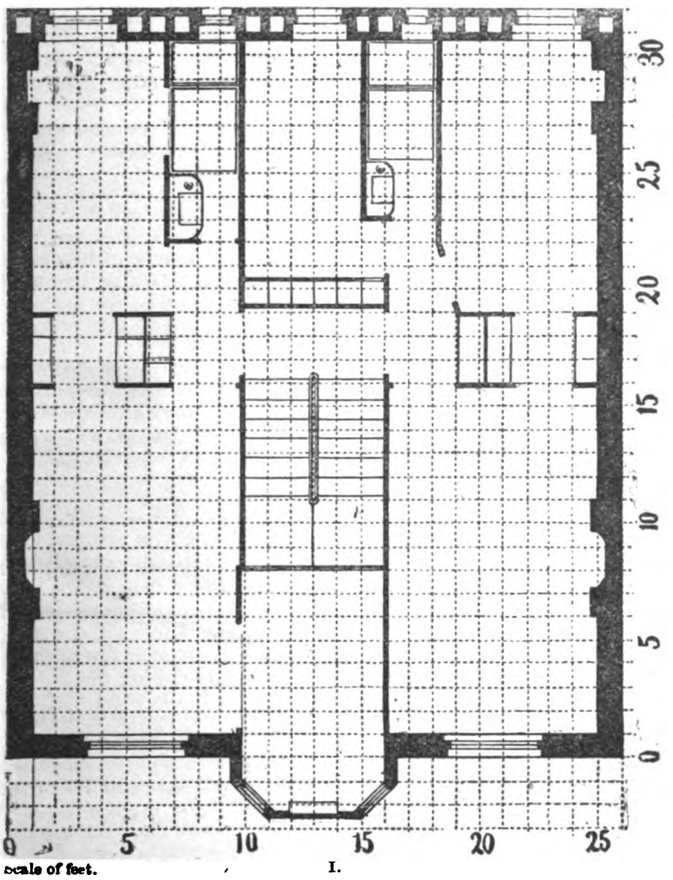
sitating the opening of new streets or lanes, and thus to avoid not only the difficulty of introducing lanes in the city, as now laid out and partly built up, but also to avoid all questions as to the policing of such lanes, the difficulty of keeping them neat, and whatever drawback there is to the renting of apartments in houses fronting on them.

Fifth. To avoid, as far as practicable, things to be used in common, the need of a janitor, and whatever may detract from the independence of tenants or may add to the expense of living in the house; yet, at the same time, to avoid anything mean or unusual in the finish or appearance of the house, and whatever may unfit it, or seem to unfit it, in any way, for occupancy by persons of the highest social position.

In these plans the publicity and embarrassment of entering apartments from galleries is avoided, as well as the semi-publicity of corridors, together with their liability to espionage, noise, difficulty of policing and keeping clean, and the absence of a proper thorough draught through them and through the rooms entered from them. The only corridor is a glazed passage, such as is common in office buildings, which is used to connect, on the entrance floor, the front and rear buildings into which the house is divided.

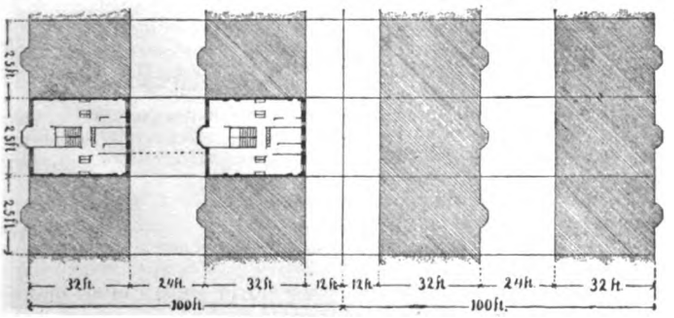
There are two apartments on the entrance floor, and four apart-



Scale of feet. I.

ments on each of the floors above, two being in the front building (see Diagram I.) and two in the rear building.

Each apartment consists of vestibule or ante-room, sitting-room, bed-room, bath-room (with water-closet, bath arranged as on a yacht, laundry tub, and sink), kitchen, private lift from basement to roof, private well lighted and finished off basement-room or cellar, private coal vault, and private clothes-drying yard or roof garden. The rooms are small, but such as the smaller private parlors of many hotels through the country, the hall bedrooms of many houses in New York and elsewhere, and the kitchens of many French apart-



II.

ments show will suffice for the needs of a large number of persons who, being without family, still wish the privacy of a separate home, but without the expense of a larger home than they need. Servants need not be dispensed with, but, as is common with bachelors' chambers, are expected to sleep out. Janitors can be employed if preferred. The stairs are easy, of one size and finish from basement to roof, and well lighted and ventilated.

A light, well-railed bridge connects the roofs of the front and rear buildings, to serve as a fire-escape.

A court or yard, of the full width of the lot and twenty-four feet deep (see Diagram II.), separates the front and rear buildings. There is a similar court of half the depth behind the rear building. A careful examination will show scarcely an apartment-house in New York or Boston that does not lack some of the safeguards of health in regard to ample air-spaces, and the opening of all rooms by windows on them, embodied in this plan. The bearing of this plan on the problem presented by those offering prizes in the recent competitions in tenement-house plans is recommended to the attention of those interested in that subject.

If larger apartments and a variety in the number, size, and distribution of their rooms be desired, should they be obtained by having, for instance, one apartment in place of the two shown on the plan, in the width of a twenty-five feet lot, or by using the front and rear buildings of the plan on wider lots (such as property in New York, although obliged to retain the standard depth, is often found divided into), the main merits of the plan can still be retained and its excellence for deep lots availed of.

The benefits of the plan to which attention has so far been called will be secured should it be carried out on a single lot only. This calls for no great outlay of capital, whether that of several persons combined or of a single individual. The whole increased cost of dividing a building, as shown, into front and rear buildings, and so securing the benefits of light and air and thorough draught in every room, and so too higher rents, need not exceed five to seven hundred dollars. The chances are that the yards or air-spaces shown in the plan, like the yards of houses in general, will not for many years be shut in by adjoining houses built up in the rear, or perhaps on the sides. So long as this remains the case all such defects as are inherent in courts, even as large as these, will be avoided; for, being open at the sides and in the rear, they will be courts only in name. But if, further, the lot in the rear should be similarly built on, that would secure permanently (as shown by Diagram II.), between the two rear buildings, a court or yard like that between the front and rear buildings, which, whether it remained open at the sides or not, would still have twenty-four feet as its smallest dimension; and if, in addition, the adjoining lots be similarly built on, that would further give permanently (as also shown by Diagram II.) what would be, in effect, rows of shallow houses (thirty-two feet deep each), yet all entered from the main street, but separated by continuous air-spaces, like streets twenty-four feet wide. Such street-like air-spaces would approach in width some fashionable streets in London, and would exceed the width of many business and other streets in that city, the healthiest, according to statistics, in the world. The results to be obtained by carrying out this plan, or one embodying its leading features, both on a single lot and on a number of adjoining lots, are recommended to the attention of all interested in the evils of New York flats and tenement-houses, and in the evils brought about everywhere by over-deep lots, and who seek how best to lessen or avoid them.

This plan, made with reference to the intention but not the letter of existing legal enactments, is only one way of dealing with certain great and small evils to which, one after another, attention has been drawn during a long study of the subject of urban housing. Therefore it is of less importance to call attention to the plan than to call the attention of all interested in the wide and important general subject of dwellings in cities to the evils which it aims to avoid. Yet the more those evils are studied, the more will this plan be valued as a study in the distribution of areas, so as to get by the least expenditure the highest return in rents and in sanitary excellence. For as the public attention is being more and more turned to sanitary excellence, so will higher rents be more and more paid for what gives the best assurance of commanding it. — *Edward T. Potter.*

THE SEWERAGE OF THE SMALLER TOWNS.[1] I.

I PROPOSE to consider the subject of the sanitary drainage of the smaller towns, which, whether they have city charters or not, are, in their physical characteristics, more like villages than like the larger cities.

It seems to me that the difference of conditions between large and small towns, so far as relates to the removal of their waste matters, has not been sufficiently considered in arranging plans for their drainage; our best drainage engineers have gained their experience and have formulated their practice in connection with works in large, populous, and prosperous towns, where much of the area is covered with buildings and with pavements, where the frontage of private property is short, and where the cost of extensive works may easily be borne. When such engineers are appealed to to furnish plans for the sewerage of the smaller places now under consideration, they quite naturally apply to the work the skill, experience, and judgment which they have acquired in their larger practice. As a result, the projects for the sewerage of these country towns are either not carried out be-

[1] A paper by Colonel G. E. Waring, Jr., read at the Social Science Convention lately held at Saratoga.

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cause of the great expense that the work would entail, or, among other disadvantages, they are carried out at a cost which leads to the long-continued embarrassment of the community.

All things considered, it is safe to say that the question of the cost of these sewerage operations is hardly less important than that of their sanitary efficiency. It is extremely important, not only that the work be well and properly done, but also that it be done in such a manner as to interfere as little as possible with the financial prosperity of the community. Inordinate outlay in one direction implies restricted outlay in others. Sewers which are so costly as to embarrass the municipal government entail a restriction of necessary expenses in other directions which have a more or less direct influence upon other aspects of the sanitary question.

In order to judge what is the best course to be pursued in arranging for the drainage of a town of limited population, limited wealth, and relatively large area, it is important to consider carefully the different offices which sewers are intended to perform, and the relative importance of these offices.

Public drainage works generally have for their object the removal of storm-water, of excessive soil-moisture, and other foul liquid wastes proceeding from private houses and from factories, slaughter-houses, etc.

It is no part of my present purpose to discuss the question as to the relations of these different elements of work in a large city. In considering the case of a small town, their relative importance covers the very basis of all our calculations. Certainly, no town, with wide, unpaved streets, with considerable land about most of its houses, and with a population of limited wealth, would think of constructing an expensive system of large sewers for the sake of getting rid of the storm-water which falls upon its surface. Such storm-water often produces inconvenience, and on rare occasions it does damage to public and private property; but, so far as my observation goes, there is not a small town in the country where this inconvenience might not be avoided, and this occasional injury remedied, for very much less than the interest upon the original cost of a comprehensive system of large sewers.

Large sewers which are made of brick, or of pipes with imperfectly cemented joints, serve an excellent office as a means for the outlet of soil-moisture. That is, they make excellent under-drains. Occasionally, but not always, while they serve as under-drains in wet weather, they leak out contaminating sewage into the soil in dry weather. Considered with reference to their action in removing soil-moisture, they are extremely costly. The work which they perform in this way might be secured for an infinitely smaller outlay by an independent system of soil-drains. Then, too, in many cases, if not in the majority of cases, the soil is naturally of such a character as to render their action in this regard unnecessary. In these instances the *constant* effect of their porosity or leakage would be an injurious one.

Of the three offices of a system of sewers, the removal of domestic and manufacturing waste is not only by far the most important consideration, but it is, in many small communities, the only one which is worthy of a moment's consideration. A town of twenty thousand inhabitants does not contemplate the construction of a system of sewers to get rid of its rain-water or to get rid of its soil-water, but because it finds itself harassed on every side by the accumulation of foul organic matters, whose decomposition produces an immediately deleterious effect upon the health of the population, and a shameful and annoying nuisance. I shall assume, for the purposes of this discussion, that this latter consideration is the *only* one which need enter into the argument; that it is simply a question of removing household waste, the outflow of factories, chemical works, dye-houses, etc., and all other liquid or semi-liquid matters of which the organic constituents may undergo offensive and dangerous decomposition if retained within the limits of the town, — and a question of the efficiency and economy of doing this by the use of large sewers or of small sewers.

In my studies and observations on this subject I have been very slow to withdraw from the conviction, universal some years ago, and still adhered to by many among the more experienced men of the profession, that the most efficient drainage of a town is to be secured by the use of sewers constructed and arranged to receive all or nearly all of the rainfall. While I do not, even now, altogether abandon this conviction with reference to large cities, I believe that I have sound reasons for the faith to which I have slowly come, that in the case of the smaller towns the separate removal of the foul drainage only is as much better than the former practice as it is cheaper. I will take, as an illustration of my meaning, the case of a town in New England with a population of about twenty thousand, for which a plan has recently been prepared that contemplates the admission of storm-water to the sewers. The arguments used by the engineer in his report to the authorities are based upon a comprehensive review of the best that has been written on that side of the subject. His smaller branch sewers, even those extending into short streets with very few houses, are twelve inches in diameter. The collecting sewers are considerably larger, and the main outlet, which is of great length, is more than five feet in diameter. It is not necessary to consider in this connection the utility and importance of the larger sewers, but the arguments concerning the twelve-inch pipes are instructive. With reference to the cleansing capacity of the flow and the calculations of grade and size, we are repeatedly told that the assumed velocity, upon which thorough flushing must depend, is based upon an amount of discharge that will cause the sewer to run *half full*. The rate given is three feet per second. Now a twelve-inch sewer, running half full and having a fall of one in three hundred (needed for a velocity of three feet per second), would discharge nearly half a million gallons per day. I assume that the outflow of the average of houses in such towns does not exceed thirty-three and one third gallons per day per head of population. It would therefore require a population of about sixteen thousand to fill a sewer of this size, and lying on this inclination, half full, supposing the flow to be uniform day and night. If we assume that one quarter of the daily flow is discharged in three hours, — between eight and eleven in the morning, — the sewage of about eight thousand persons would fill the sewer half full at least once a day, and this would suffice for flushing purposes. Eight thousand persons would probably occupy over sixteen hundred houses, and, theoretically, it would require this number of houses to furnish sewage enough to keep the twelve-inch pipe in good condition. As in the case in hand, there is probably no instance where a population of five hundred is to be served by a twelve-inch pipe, we must assume that it was contemplated to depend entirely upon the rainfall to keep the sewers properly flushed. Did rain fall in sufficient quantity and at sufficiently frequent intervals to secure this result, this part of the difficulty would be overcome. But often many weeks elapse during which no storm-water whatever enters the sewers. This is, too, generally at the season when decomposition is the most active, and when its effect upon the atmosphere is the most injurious.

It is very well understood that sewage matters, if removed within twelve or even twenty-four hours after production, generate little, if any, injurious gas, and that if they lie longer than this they become increasingly dangerous and offensive. Therefore, in the present example, the sewers being all of a size which the household flow is by no means adequate to cleanse, and the rain-water cleansing being very intermittent, we should have, practically, throughout the whole year, an accumulation of decomposing organic matter within the sewers, which every consideration should lead us to avoid.

Furthermore, the admission of surface-water from ill kept or from unpaved streets results in the carrying into the sewers of heavy earthy matters which the ordinary flow is incapable of moving forward to the outlet, and these are largely intermixed with horse-droppings and with other organic matters, which, so far as they remain within the sewers, cannot fail to be subject to the gravest objection. Whether or not the difficulty increases as we pass from the smaller sewers to the larger ones will depend very much upon the gradient or inclination of these latter. If they are steep enough for an active current, most of the foul substances which they receive may be carried forward to the outlet though the flow may be only a few inches in depth. If, as is very often the case, the land through which they pass is nearly level, and their gradient is very slight, they accumulate rubbish more and more until it becomes necessary to cleanse them by hand or by the use of mechanical appliances. During the whole time that this foul matter lies in the branch sewer or in the main it is necessarily undergoing decomposition. It is producing the condition which has given to ordinary city sewers the frequent appellation of "elongated cesspools." I believe that this condition is inevitably inherent in the character of all large sewers which are not furnished with such means of thorough flushing as will be adequate to sweep them entirely clean, from end to end, — and at intervals not longer than twenty-four hours, — of all earthy or organic matters which may have gained access to them. I believe that such sewers as are ordinarily used in large cities are, for reasons stated, extremely objectionable, and that they can be made satisfactory only by the general introduction of the most copious flushing appliances, — with a completeness which has never been adopted, and which probably has never been contemplated, in this country.

I believe that for the smaller towns, such as we are now considering, storm-water sewers are not only inadequate to the work for which they are designed, but are absolutely injurious, — to such a degree that it sometimes becomes a serious question whether they do not do more harm than good. In other words, I believe, not only that these large unflushed sewers, when applied to the uses of scattered communities, are extravagant in cost, but that the injury which they are capable of working may far outweigh any advantage that they may secure. They remove, without injury to public and private works, the water of heavy rains, and so they do good. But, on the other hand, they do not remove, they only conceal from sight and store up in a most dangerous condition, foul matters, which had much better be left to decompose on the surface of the ground in full exposure to sun and air. Better the absolute stink of dirty streets than the dangerous gases arising from unventilated accumulations of rotting filth.

So far as the removal of storm-water is concerned, nothing more need be said in this connection than has already been said, namely, that it costs more than it comes to. I know of no instance, even when the grades are steep and the soil subject to wash, where the injury done by the heaviest storms bears any proportion to the interest on the cost of such gigantic engineering works.

Regarding these large sewers as out of the question for our purpose, I venture now to suggest what seems to me a satisfactory substitute for them.

I begin with the idea that the most costly and the most dangerous

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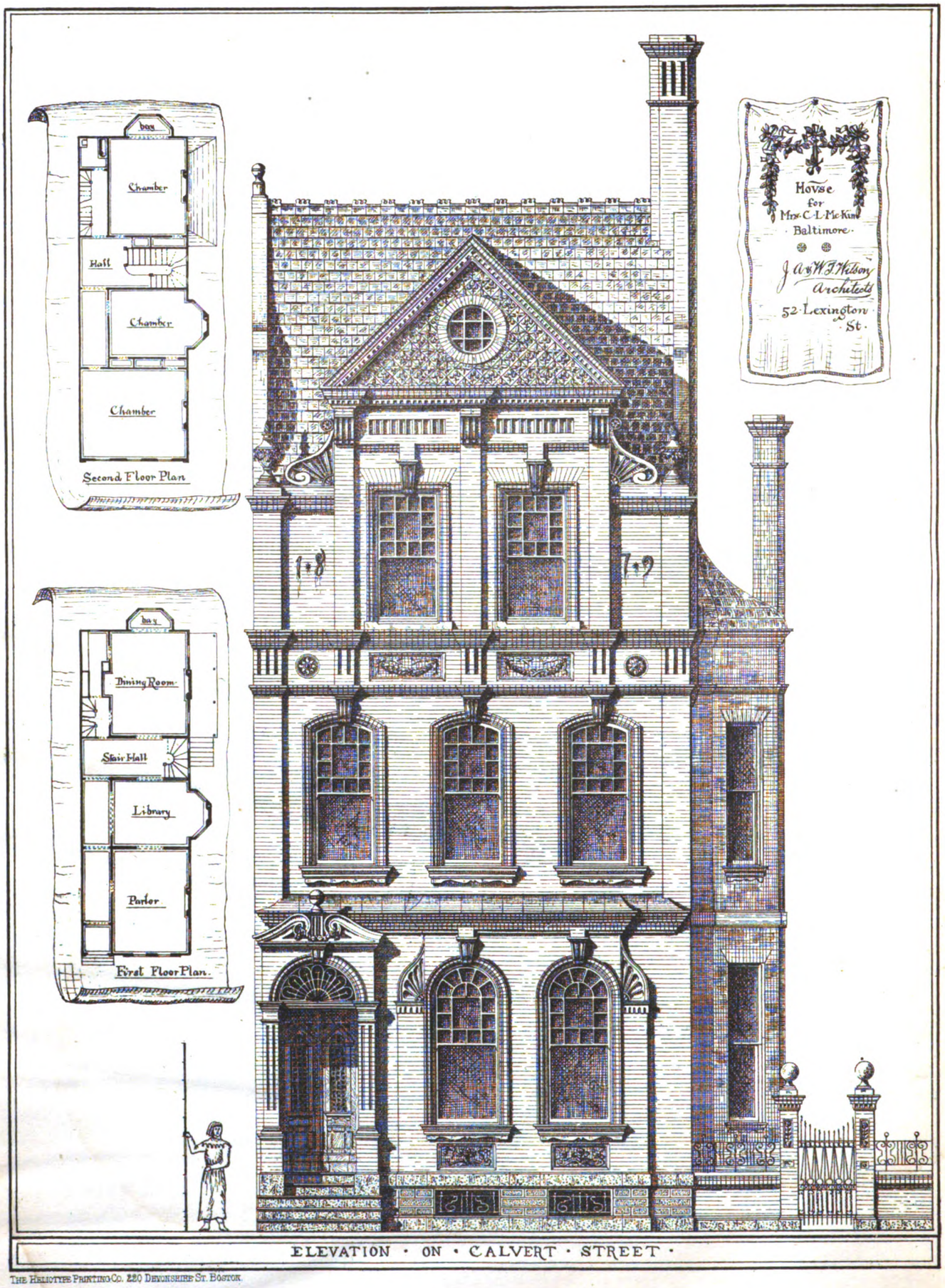

ELEVATION · ON · CALVERT · STREET ·

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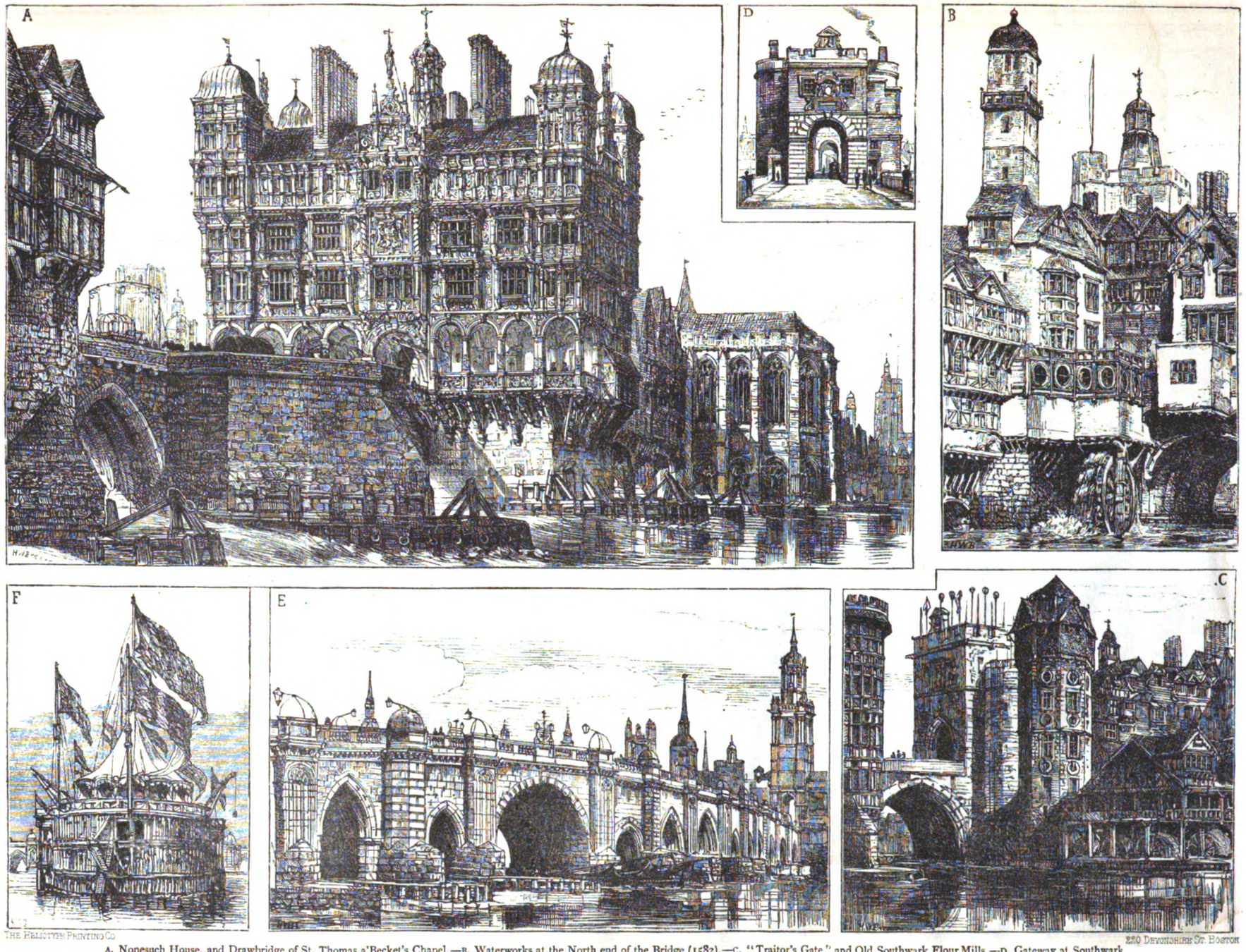

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A. Nonesuch House, and Drawbridge of St. Thomas a'Becket's Chapel.—B. Waterworks at the North end of the Bridge (1582).—C. "Traitor's Gate" and Old Southwark Flour Mills.—D. Gateway at Southwark end of the Bridge as Rebuilt (1728).—E. General View of the Bridge after Repairs and Alterations (1760).—F. Cofferdam constructed for the building of "New London Bridge" (1825).

OLD LONDON BRIDGE

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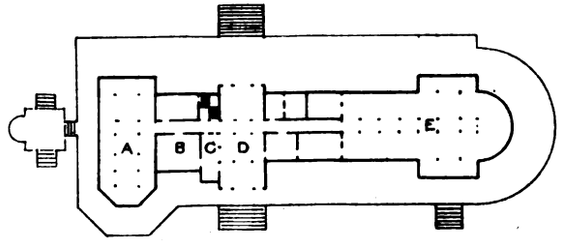
No 196
American Architect and Building News Sept. 27, 1879

Hotel Nantasket

Nantasket Beach

J. Pickering Putnam, Architect, Boston.



A. Parlor. B. Ladies' Parlor. C. Office.
D. Grand Entrance. E. Grand Dining Hall.

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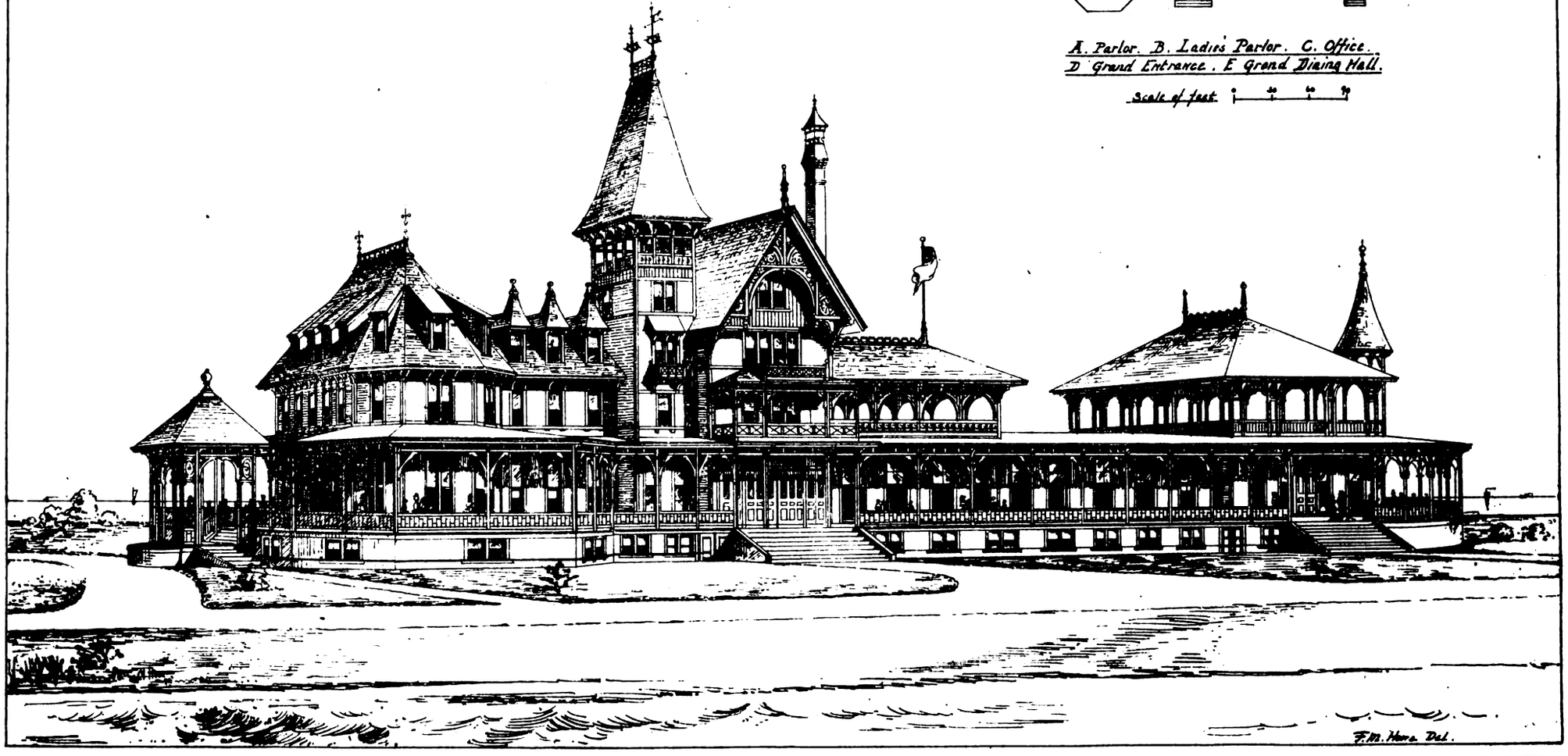

F.M. Hunt Del.

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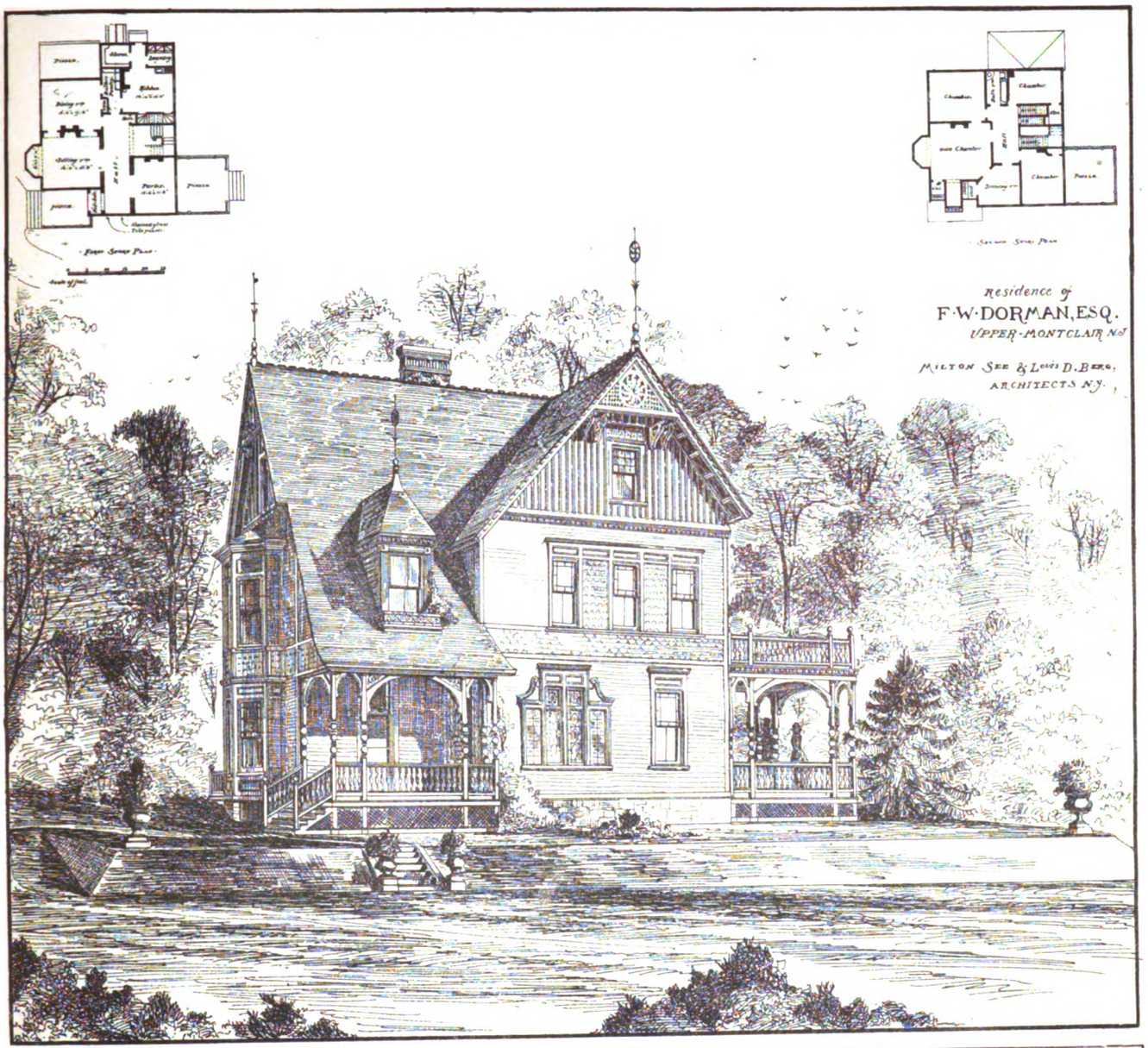

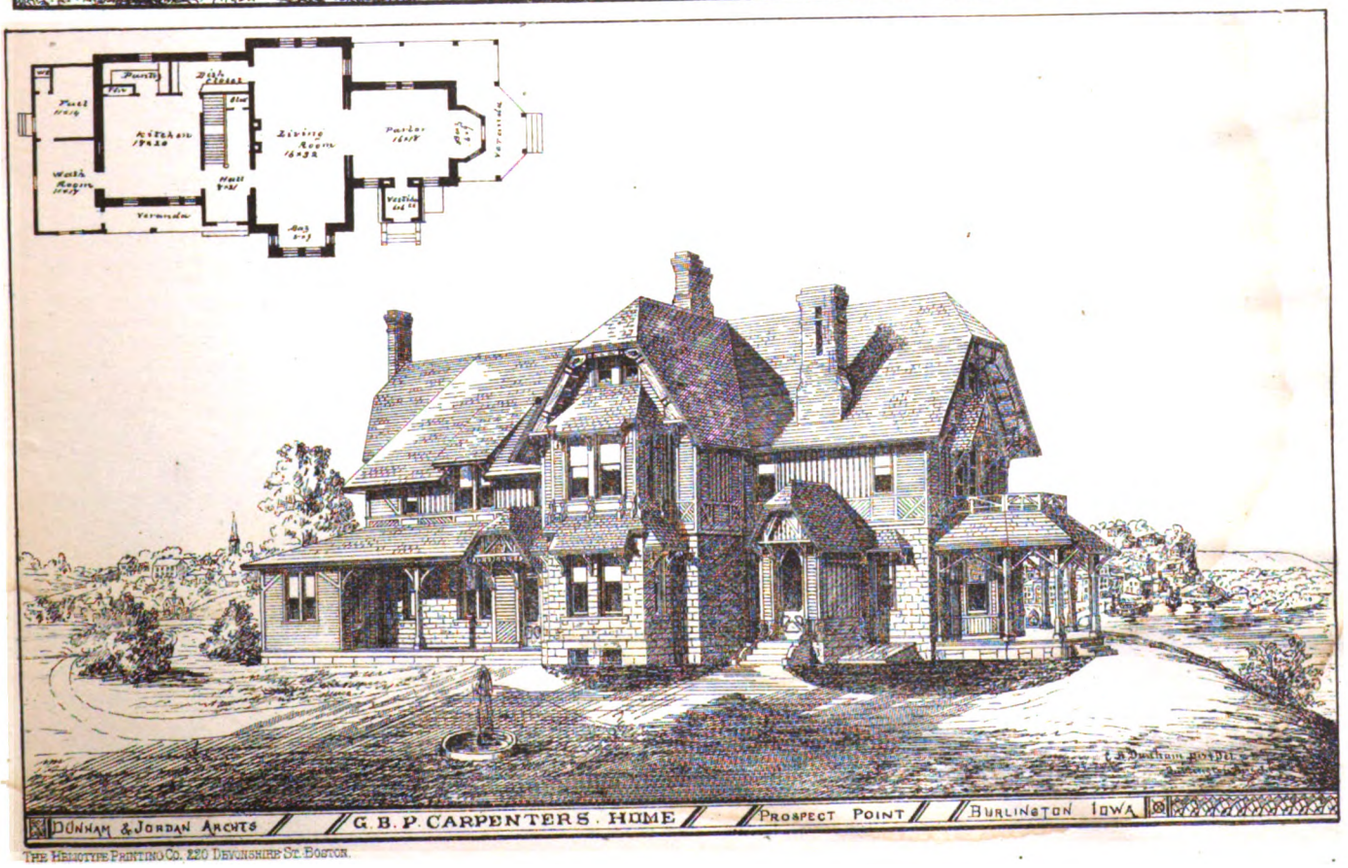

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scavenger that a city can employ is the rain that falls upon the surface of its streets. Under proper municipal control the organic matter deposited in the streets may easily be confined almost entirely to the droppings of horses, and this material has a value which will go a long way towards paying the cost of its immediate collection and removal. Even were this not the case, the necessity for performing such work regularly and systematically, with a view to the preservation of the purity of the atmosphere of the town, needs no argument.

There are exceptional cases, where the surface flow of the streets, accumulating in valleys, may require some special means for its removal. But even here it will often be cheapest and safest to arrange the surface conformation and the pavement of the necessary street surfaces so as to secure its removal above ground. It may occasionally be necessary to construct underground sewers for its secure discharge.

These exceptional cases do not, of course, affect the main argument. So far as the sewers themselves are concerned, which it is proposed to furnish to a town of the class under consideration, we have *only* the sanitary question to regard. Our aim should be to collect all foul outflow from private houses and other establishments, in the most direct and immediate way, and to carry it, within the shortest time possible, to its final point of disposal beyond the limits of the town. The sewers should be adjusted to this work, and to no other; and every pipe of the whole system should be swept entirely clean, at least once a day, leaving nothing to decompose and contaminate the confined atmosphere within it, except such matters as may attach themselves, as slime, to the walls of the pipes; and the amount even of this sliming should be as much as possible reduced.

These ends are to be secured by making absolutely tight sewers of a size proportionate to the service which they are to perform; by giving these, so far as practicable, a uniform descent; by gathering the branch sewers into collecting drains, and mains which are only large enough for the purpose, and by carrying the outlet of the whole system to a suitable point of discharge. There should be nowhere in the whole course of any one of the drains an opportunity for halting and decomposing by the way; no depression where the flow may at any time slacken, to deposit silt and gradually form a hardened accumulation, lessening the capacity and injuring the channel of the drain.

Those who have not considered the subject have little idea of the discharging capacity of small pipes. The following calculation is suggestive.

A pipe six inches in diameter, having an inclination of four inches in one hundred feet (a fall of one to three hundred), has a capacity of discharge of nearly two hundred gallons per minute, or twelve thousand gallons per hour; or between eight and eleven in the morning of thirty-six thousand gallons. If one fourth of the daily flow is discharged in these three hours, then the daily capacity of this sewer would be one hundred and forty-four thousand gallons. Suppose, now, that each household numbers five persons, and that the consumption of water or the amount of outflow is thirty-three and one third gallons per head per day. Suppose, too, that the sewer is to run at no time more than half full, a six-inch sewer on such a grade would then serve for the drainage of over four hundred houses. Allowing a width of only twenty-five feet for each house-lot, this six-inch sewer would suffice for a street nearly half a mile long, built up on both sides.

It has been amply shown by experience that the sectional area of a drain which receives numerous branches need not be increased in proportion to the combined capacity of those branches, for the reason that additions to the stream, if introduced at proper curves, add to the velocity of the flow, and increase the discharging capacity.

A computation of the capacity of collecting and main drains needed to discharge the outflow of a number of six-inch drains, conditioned as I have described, would show very much smaller sizes than would generally be supposed.

Until recently, the objection has existed to the adoption of so small a size as six inches diameter, that it was found necessary in order to remove the accumulation of deposit at the upper ends of sewers, where the flow is slight, to adopt some system for hand-cleansing; and this cannot well be done in a six-inch sewer. More recently the adaptation to the flushing of sewers of the automatic siphon-tank of Rogers Field, of London, has so far removed this objection as to reduce the risk of obstruction to insignificance.

Sewers of this size should receive no inlet from any source more than four inches in diameter, and this should be the extreme limit of size of all connecting drains throughout their whole length. Any solid matter which could find its way through a four-inch drain would surely be swept on by a copious flow through a six-inch sewer.

THE ILLUSTRATIONS.

HOTEL NANTASKET, HINGHAM, MASS. MR. J. P. PUTNAM, ARCHITECT, BOSTON, MASS.

THIS hotel was built during the past spring.

LONDON BRIDGE.

We reproduce from the London *Graphic* the drawings of London Bridge and its former surroundings, and Mr. Brewer's description of it.

"The threatened alterations to London Bridge naturally make us turn our minds to the consideration of the history of that remarkable structure. Fortunately the annals of London Bridge have been most carefully collected in an excellent work, entitled The Chronicles of London Bridge, by an Antiquary. (London, 1827.) The work is illustrated with wood-cuts which, though architecturally incorrect, are suggestive and interesting. In the short account of London Bridge which we are about to give, we shall borrow considerably from the work we have just named.

"When the first bridge across the Thames was erected seems to be extremely doubtful. Probably the Romans established a bridge of boats across the Thames, either at London or in the immediate neighborhood; but there does not seem to have been any really permanent bridge before about the year 994, and it is said that the fleet of Sweyn was driven against it by the wind.

"In 1008 the good King Olaf of Norway, who was an ally of Ethelred, captured London Bridge from the Danes, by attaching boats to the piers, which, being violently rowed in an opposite direction, tore away the piles and brought the bridge to grief. It was restored shortly after, but again destroyed in 1091,—this time by a terrible whirlwind, which unroofed more than sixty houses in the neighborhood. William Rufus, in 1097, commenced the reconstruction of London Bridge; but it still seemed to have been doomed to misfortune, for in 1136 it was consumed by fire, and again rebuilt in 1163.

"In 1176 the great work of constructing a stone bridge was commenced under the superintendence of a priest, called Peter of Colechurch, and the structure which he erected was, though altered and partly rebuilt at various times, substantially the building known as 'Old London Bridge,' which existed down to the year 1830.

"Now, much as modern engineers and architects have criticised the work of Peter of Colechurch, yet it was no small thing to have constructed a bridge which resisted the force of the Thames for six centuries and a half. As originally erected Peter Colechurch's bridge consisted of nineteen arches and a drawbridge, so that there was a pier in the centre; this pier was of immense size, in fact, a small island, 125 feet long and 35 feet wide! The other piers were about 50 feet long and from 20 to 30 feet wide, whereas the arches between them varied from 10 to about 30 feet. The roadway between the piers was 40 feet. Upon the eastern half of the vast central pier Peter of Colechurch erected a beautiful chapel, with an open crypt beneath it; he also built two gateways, one defending the drawbridge, which occupied the place of the seventh arch from the Surrey side, and one near the London end of the bridge; no other buildings of any kind stood upon the bridge. It is clear, however, from ancient illustrations and descriptions, that there were houses built upon it, at least as early as the time of Henry VI.; and it is related by the old chroniclers that Jack Cade 'cut the ropes which suspended the drawbridge,' and Hall adds, 'The houses on London Bridge were burnt during this rebellion.'

"Although none of the accounts of London Bridge notice the fact, yet it is quite clear that Peter Colechurch's chapel must have been rebuilt some time between the reigns Richard II. and Henry VII., as from all existing illustrations, and the remains discovered in 1826, it was evidently of the Perpendicular style of Gothic architecture. During the reign of Elizabeth, great alterations were made, the old gateway at the drawbridge being taken down and rebuilt at the Southwark end, as shown in our sketch marked C. This gate received the name of 'Traitor's Gate,' from the fact that the heads of those executed for high treason were exposed upon it, stuck upon iron spikes. In the foreground of our sketch the old Southwark flour mills are seen, with their tower and numerous water-wheels. But the most remarkable building on London Bridge was the old 'Mansion House,' the residence of the Lord Mayor, called 'Nonesuch House.' This magnificent building was erected about the year 1579, and was entirely constructed of timber, and adorned with such a profusion of carving and ornamentation that it received the appellation of 'Nonesuch House.' It is said to have been constructed in Holland, and floated up the river in pieces, which were fixed together when they arrived at their destination. Nonesuch House, together with the drawbridge and the old Chapel of St. Thomas à Becket, are shown in our sketch marked A.

"In 1582 Peter Moris, a Dutchman, established the first waterworks at the north end of London Bridge. This building is shown in our sketch (B). The ancient buildings of London Bridge were frequently destroyed by fire; thus in 1632–33 all the buildings at the north end of the bridge were burnt down. The bridge did not suffer greatly by the Fire of London, 1666, only one large building at the north end being destroyed. It did not however, enjoy this immunity long, for in 1726 the bridge gate and sixty houses at the south end of the bridge were burnt down; in 1728 the gateway was again rebuilt, as shown in our sketch (D). Probably about this time the apse of the chapel was pulled down, and the building, which had previously served as a school, was converted into a paper factory. In 1758, whilst some extensive alterations to the bridge were in progress, the temporary footway which had been erected caught fire, and not only burnt down many houses, but even four or five of the arches. After this a clear sweep was made of all the buildings upon the bridge, the great centre pier removed and replaced by a large arch, and a balustrade erected in the place of the old solid parapets. These alterations were completed about the year 1760. The general appearance

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of the bridge after they had been carried out may be gathered from our sketch (E).

"The destruction of the central pier proved that if Peter Colechurch was not a greater engineer than his eighteenth-century critics, he was at least a wiser man, for no sooner was this great pier removed than the bridge began to exhibit signs of decay, and from that time until it was finally pulled down it was perpetually requiring repairs. William Gifford, in his Works of Ben Jonson, London, 1816, makes the following violent attack upon the bridge authorities: 'This pernicious structure has wasted more money in perpetual repairs than would have sufficed to build a dozen safe and commodious bridges; and the lives perhaps of as many thousand people. This may seem little to those whom it concerns, but there is blood on the city, and a heavy account is before them. Had an *alderman* or a *turtle* been lost there, the nuisance would have been long since removed.' The first stone of the new London Bridge was laid on the 15th of June, 1825, and our sketch (F) shows the magnificent cofferdam constructed for that purpose.

"As the Old London Bridge was ruined by injudicious alterations, it is sincerely to be hoped that the present noble structure will not share the same fate, and that its beauty shall not be destroyed nor its stability endangered by any experimental patch-work. The experience gained by patching up the old bridge ought to make us consider for a long time before submitting the present structure to any similar risk. We trust that both the legislature and the city authorities will reject any scheme which does not insure the beauty and stability of this noble work. The city authorities of our day have shown so much public spirit in purchasing Epping Forest and Burnham Beeches, that we may feel some confidence that they will be equally active and judicious in this matter, and that without their attention being called to it by the sacrifice of 'an alderman' or even 'a turtle.' What is really wanted is undoubtedly another bridge a hundred yards from the present one, so that the heavy wagons could keep to one bridge and the lighter traffic to the other."

HOUSE FOR MRS. C. L. McKIM, BALTIMORE, MD. MESSRS. J. A. & W. T. WILSON, ARCHITECTS, BALTIMORE.

This house is now building on Calvert Street, near Chase. It has a front of 23 feet, with a depth of 68 feet 6 inches. The stories are somewhat higher than usual. The front is of the finest quality red pressed brick, laid in red mortar, with all string-courses, mouldings, etc., of "Peerless" brick, which give nearly as true and sharp a line as cut stone. All other decoration, carved work, sills, etc., is of red terra-cotta from Perth Amboy, N. J. Basement of red granite. Roofs of black slate with red terra-cotta crestings.

HOUSE OF G. B. P. CARPENTER, ESQ., BURLINGTON, IOWA. MESSRS. DUNHAM & JORDAN, ARCHITECTS, BURLINGTON.

This sketch is made from a house finished about two years ago at a cost of $7,000. First story stone, second story wood, filled in with brick laid flat.

HOUSE OF F. W. DORMAN, ESQ., UPPER MONTCLAIR, N. J. MESSRS. SEE & BERG, ARCHITECTS, NEW YORK.

This house was completed this year at a cost of $4,700.

A MILLIONAIRE'S CATHEDRAL CITY. II.

The width of the church across transepts is 96 feet, the height of the spire 197, and though I do not know the height of the ridge, height is the one dimension in which the cathedral scale is approached. The cathedral arrangement, however, is carried out to the last detail. There is only one tower, a central one, but there are a nave and aisles, though only of four short bays; there are transepts of twelve feet projection, and transept aisles; there is an ample choir, covering nearly half of the ground plan, and, attached to the transepts, though separately roofed, there is a baptistery on one side and an organ-loft on the other. The tower stands free on three sides and forms the porch. Close at hand one becomes aware that there is a profusion of carved work for which he has seen no other American examples. Real flying buttresses are turned from the buttresses of the aisle wall, albeit some feet above the point at which they would be useful to resist the thrust of the vault, if there were a vault, and every pinnacle of the aisle wall and every pinnacle of the clerestory is flanked with gargoyles. Every gable is copiously crocketed, every offset is intricately moulded. All the aisle windows have moulded labels and carved label terminations, and are filled with rich tracery. The clerestory windows, however, have only flat, unmoulded voussoirs, which look bold amid all this regardlessness. Buttresses divide the narrow bays of the seven-sided apse; the pinnacle of each buttress here, too, is flanked by gargoyles, and the nine windows have profuse and real tracery. Through the openings of the basement of the apse one gets glimpses of the marble traceries of the crypt. The first stage of the tower contains a deep doorway, the arch abundantly moulded and the jambs modelled into a succession of shafts, with capitals profusely carved in natural foliage; and over this is a high gabled canopy richly crocketed, crowned with a large finial, and filled with tracery, not pierced, but in relief against the wall. The second stage is an arcade of slender openings, with slender and richly decorated canopies. The belfry stage consists of a very large traceried window in each of the three free faces. The canopy of the window is a gable of very steep pitch, which completes the tower. The octagonal spire becomes visible in the sharp angles between these gables, where the buttress ends in a long pinnacle. After the spire is fairly detached and well on its way four other pinnacles appear out of the spire itself, not against, but between, its ribs. The windows, the gables, and the pinnacles are all lavishly decorated.

This description is not by any means exhaustive, but from the description it will be evident that here is elaboration beyond anything to which we are accustomed in church architecture. Here, in at least the sense of Wackford Squeers, is richness; and indeed there is richness in a much better sense also. The repetition of so many parts in so small compass tends to that result, and still more the abundance of carving. The carving is as careful as can be, imitated directly from natural objects, and in the right places. And yet one finds himself wondering all the time that this superfluity of means does not more fully attain an end, and that this fretted front and this intricate succession of bay and buttress make less impression on him than many a flank of rock-faced wall pierced with rude but purposeful openings. There are no powerful masses of structure felt through these meshes of ornament, no leading lines to accentuate with all these moulded subdivisions. The whole is not large enough, in mere physical magnitude or in idea, to dominate this multiplicity of petty parts, and the cathedral becomes a toy, and recalls the attenuated confectionery of "Greenwood Gothic." The tower with its slim terminal gables looks weak, and its weakness is enhanced by the wealth of carving which it carries. It is nowhere belted by an emphatic band or an emphatic line. The strange, irrational pinnacles that are inserted like spikes in the steeply slanting spire, as they have no purpose, can scarcely have had any other origin than the desire to make more "things." The portal is deep, and yet so commonplace is the series of shafts below and archivolts above that its depth is ascertained as a matter of mensuration, not of instant poetical impression. All of the detail, rich and careful as it is, furthers the character of an elegant feebleness that belongs to the church. The foliage is as natural as chisels could make it. Everywhere accurate reproduction is aimed at; nowhere the use of natural foliage as a type, to be adapted to its material and function, — that is to say, conventionalized. As a consequence, it lacks altogether architectural significance. The gargoyles have nothing of the grotesqueness of one good manner, and nothing of the abstraction and severity of another. I recall but three patterns among the scores of them, and these are but figure-head portraits of uninteresting faces, with a three-inch leader emanating from the mouth of each. The mouldings add to the undecided look of things. The crisp emphasis of lines of light and hollows of black shade is abandoned for wavering profiles in which emphasis seems to be studiously avoided. What is aimed at is elaborate elegance; what is attained, as I have said, is weak elegance. The most successful feature of the exterior is the baptistery attached to the south transept, which is roofed with slabs of stone and crowned with a rich and slender *flèche*. In proportion and in detail this is a pretty toy, though it is still a toy.

I have dwelt upon the exterior in detail, because of its extreme elaboration and costliness, and because it is considerably more successful than the interior. One is surprised after all this lavish expense to come upon a lath-and-plaster barrel vault. The nave walls are carried upon columns which are at present fasces of cast-iron, but are ultimately to be sheathed in jackets of bronze and crowned with bronze capitals. The wall-arches of the nave are of sandstone, and are the most vigorous pieces of design in the whole church, though they would not be noteworthy for vigor in another church. A panelled wainscoting of sandstone skirts the whole church, and the porch is lined with the same material. The spandrels of the nave arches are filled with panelling in plaster, with a panelled arcade under the sill course of the clerestory, and above this the vaulting shafts, now of iron like the nave piers, and like them to be jacketed in bronze, are to spring from long plaster corbels, and to be finished with spreading plaster capitals. There is no end to the plastering. Each shaft of the little arcade is to have a plaster capital, each label of the aisle windows two plaster pendants. There must be twenty patterns of these capitals, all carefully modelled from flowers and leaves. The corbels of the vaulting shafts are human faces, rather Greek than Gothic in type. The vaulting is very elaborate, with a great number of interesting ribs, applied to the plain surface of the pointed tunnel, and at almost every intersection there is an elaborate boss. Along the ridge rib these bosses attain a considerable size, and a very large stalactite was shown me, which is ultimately to decorate the intersection of the nave and transepts. The modeller of all this work is Mr. Bradley, an Englishman, and of its kind his work is excellent. "Photography in the round" could scarcely be carried to a higher perfection, and there is also in his plaster bouquets much grace of arrangement. But the moulded work of the interior is even more devoid of architectural character than the carved work of the outside. There also seems to be in it a defect of scale, which will deprive it in its place of the effect it has when seen close at hand, and it is likely that it looks better on the bench in the modelling room than it ever will hereafter. It will always attract attention by its extraordinary and in this country unexampled profusion. Except this modelling there will be nothing in the church to call for thoughtful admiration. It is intended to decorate the interior in color, but color as irrelevant as the moulded ornament can only assert itself, and color applied as a factor in the general result cannot redeem the tame mediocrity of the design.

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Rich as the outside and the body of the church are, they are meagre compared with the crypt, which contains the mortuary chapel, and the elaboration of this is all wrought of noble material. The approaches to it are altogether without dignity. It is a curious feature of the conception of a cathedral which has inspired the design, that the basement of the body of the building is given to a "Sunday-school room" ceiled with brick arches turned between iron beams and resting on iron posts. The crypt itself is a polygon of fourteen sides, about sixteen feet in diameter and eighteen high. Seven of the sides are continuations downward of the faces of the apse; the other seven correspond to nothing above them, and end abruptly on the outside against the ceiling of the Sunday-school room. Each face constitutes a bay, and access to the room is gained through two of them, which are left open for the purpose. The walls, the cells, and even the ribs of the vaulting are of polished white marble. It would be hard enough to get sharp mouldings from this material, however they were drawn, but the attempt is not made here, and the section of a rib shows the same meaninglessly meandering lines that we have noted elsewhere. The junction of the ribs is not a boss; in fact, the ribs do not join, but stop upon a sixteen-sided ring some four feet across, closed by a slab of polished marble. The junction of each rib is marked by a very rich pendant carved in flowers or leafage. Each rib springs from a triple capital of disproportionate size similarly carved. The workmanship of all this carving is exquisite; the design of it amenable to the same criticism as the other carved work in the church. The triple shafts which support these capitals are of costly foreign marbles, of mottled black and red and yellow. The head of each bay is filled with elaborate and wire-drawn tracery, of a design not repeated in any other, and, between the polish of this tracery and its twisted tenuity, it seems less like stone-work and more like confectionery than any of the other carved decoration. Half of the openings thus formed correspond to real windows, and half of course look into the basement of the church.

Of the crypt particularly it may be said, what is applicable to the whole church, that the attempt to make a small wonder of the world has pretty evidently had more to do with the design than any more artistic purpose. At any rate, the church is highly successful in the former point of view. The Canda monument in Greenwood, felicitously miscalled by its admirers the candy monument, which for so many years held the preëminence in capacity to hold the casual visitor in open-mouthed wonder, yields in that capacity to the newer marvel in the matter of architecture, though certainly the newer is the better, as certainly they belong to the same class. Setting aside the inflation of a parish church into a cathedral, and setting aside too the shams which deform it, the Garden City Memorial Church appears noteworthy only for the exuberance of means with which a design essentially commonplace has been carried out. The only church in this country with which it can fairly be compared is the Colt Memorial Church at Hartford. Considering that the dimensions of the two churches must be nearly the same, that their purpose is similar, and that Mr. Harrison must have had the spending of many times as much money as it cost to attain the beautiful result of Mr. Potter's work, the memorial cathedral of Long Island, as an architectural work, must be added to the long list of lost opportunities. M.

CORRESPONDENCE.

THE CITY OF TOLEDO. — THE ALCAZAR. — THE CATHEDRAL. — MADRID. — BURGOS.

TOLEDO.

WE are apt to associate Moorish architecture only with the orange and palm tree of the sunny South, forgetting that the Moors established their empire over the whole of Spain, and that some of their most remarkable works are to be found in the North. This one city contains a number of fine monuments of the Saracenic period, which lasted three hundred and fifty years. One of the first sights to the stranger slowly climbing up the long hill from the railway station — for this ancient city, like Rome, stands on seven rugged hills, half surrounded by the Tagus — is the Puerta del Sol, a magnificent Moorish gateway, which may be ranked among the finest military monuments in the world. Many leave the Alhambra with a strong impression of nothing but "gingerbread work," and without noticing that the gateways and towers there are treated with a massive simplicity in perfect artistic accord with their use. Here however there is no danger of missing this lesson of a most artistic people in thus changing entirely their style for buildings of various characters. In proportion as their summer palaces are light and richly decorated, their military monuments are massive and plain. The Puerta del Sol has a simple and grand pointed horseshoe arch, or rather arches, for there is a large vaulted space in the middle, and above plain cusped mural arcades in brick.

Seeking out the Moorish remains, the small church of Cristo de la Lúz first claims attention, for it is anterior to the eleventh century, and shows a strong similarity in the capitals and interlacing domes with the mosque of Cordova; this, too, was formerly a mosque. Of about a century later is the celebrated synagogue now called Santa Maria la Blanca. It is not large, but has five aisles, with horseshoe arches on polygonal pillars, whose capitals are rudely foliated and accentuated by a countless number of small holes, like some of the Byzantine capitals. Much finer architecturally, though with no pretence of purity of style, is another synagogue in the neighborhood called El Transito, built in the fourteenth century with a wonderful mingling of Hebrew, Moorish, and Gothic characteristics. It consists of a large hall with a beautiful inlaid wooden ceiling, and below this a series of windows filled with delicate geometric tracery. In enriching these windows every device has been lavished upon them: cusps, foliated capitals, lace-like bands that give a bewilderingly rich effect, while below is a frieze of elaborate Byzantine design. From this to the ground, some thirty feet, is a bare wall, with not a moulding or ornament. The effect is very striking. The altar end of the hall is covered with Alhambraic reliefs in stucco, but a modern altar injures that aspect now; even as it stands, this hall, fulfilling exactly the conditions of our modern public halls, is a most interesting type for us. The former rich colors of the stucco-work have faded to soft neutral tints, perhaps more grateful to our sensitive eyes than the original blaze of colors. It is curious to see how naturally the inscriptions in Hebrew take the place of the Arabic letters in the Saracenic ornamentation, and again this is a hint for the employment of our Old English letters. Passing out from this synagogue the view before the visitor shows him what a wonder of strength Toledo was for defensive purposes. It crowns a rocky height one half of which the Tagus guards with its deep gorge, while the other half so towers above the valley that it was easily defended. The contrast is striking between the bare rocky hills on one side, through which the torrent bursts its way, and the fertile valley beyond, where the same stream lingers peacefully through the meadows. Behind, frowning over the city, stands the Alcazar, a huge rectangular building with square corner towers. The entrance façade (sixteenth century) by Covarrubias is one of the most elegant Renaissance designs I have ever seen, and certainly shows a more original talent in dealing with the Renaissance than any one building in Italy. From the bold rugged *bossages* it may be described as Florentine in style, but this massive façade is pierced with windows and doorway treated with such exquisite refinement, and the small decorative orders there employed are so delicate that the whole effect is one of extraordinary elegance. Curiously this *chef-d'œuvre* is little known or noticed, as the guide-books pass lightly over it to speak of the great interior court with its fine galleries and staircase by Herrera. The building is now used as a military school; and I was surprised to see some good modern decoration in one or two halls recently restored.

Descending from the Alcazar into the town again one passes through a large triangular plaza swarming with peasants and venders of various brilliant articles, — for to sell well a thing must be bright in color, whether a can or a kerchief; the Spaniards, like their bulls, run after color. Traversing this place to reach the cathedral one runs the gauntlet of a narrow and thoroughly Spanish street, — gauntlet here stands for a whole haberdasher's equipment, which dangles across one's path, and as one dodges the flapping drawers and skirts redolent of grease, and teeming with a migratory population, a new significance is given to the old poet's lines: —

> "A winning wave, deserving note,
> In the tempestuous petticoat . . . .
> Does more bewitch me, than when Art
> Is too precise in every part."

The west end of the cathedral stands quite free, but even from here the exterior does not correspond with the far-famed interior, and the other sides are hidden by houses. The square tower surmounted by a Gothic steeple is dry and uninteresting, though three hundred and twenty-five feet high, and the domed chapel which forms its *pendant* on the other side of the west end ruins the composition as a mass. There are several florid late Gothic portals. But it is only on gaining the interior that one realizes its beauties. Though not completed till the end of the fifteenth century, the style is the purest thirteenth century, and in Mr. Street's opinion it rivals the finest of the French cathedrals. It has one great advantage over other Spanish cathedrals, inasmuch as its *trascoro* is not so high as to break the view down the nave to the apse. It has double aisles on each side of the nave with eighty-four grand piers. The length is about four hundred and four and the width two hundred and four feet.

The chapels are unusually small, being niched in between the small piers, which have no projection on the ground plan. There are however two chapels in the church which are very large. One of Santiago is a magnificent specimen of flamboyant Gothic, and contains finely sculptured tombs; next it is an almost equally large chapel with even finer tombs and sculpture. Indeed, the whole cathedral is so full of fine sculpture, metal-work, vestments, etc., that at each step new wonders come to light. The choir alone is a museum of carving in wood and marble as well as of metal-work. There are two large pulpits of brass, worthy of Cellini, by the choir facing the high altar; and there is much gilded iron-work of the sixteenth century, a period which in a still higher sense may be termed "the golden age of iron," so noble were the designs of great iron screens then erected.

There is one chapel of peculiar interest, for here every Sunday is still said the Muzarabic service which in 1572 was established by Cardinal Ximenes, to show the Pope that however Romanist they were in policy they were zealously independent in practice. This service was persistently opposed by the Popes as unauthorized by the Vatican, and obstinately continued by the Spaniards as a national ritual, for many years. The paintings as a rule are inferior in this cathedral, but the stained glass is full of the richest color, and the sacristies have such splendid vestments that this loss is little felt.

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In short, there is so much to examine that only after repeated visits can any clear idea of the cathedral as a whole be had, and then it stands out as one of the most complete interiors in the world.

The other important Gothic building here is the Church of San Juan de los Reyes, in the most florid style. The exterior is overloaded and vulgar, but the adjoining cloisters are beautiful. Their details, though late in date, show that it is never too late to mend, and the architect here suddenly struck a key-note which rings pure and fresh as a young style, instead of the pretentious decadence of the rest of the church. I have already said so much of the Plateresque style that I only mention a wonderful example of it in the Hospital de la Santa Cruz. Its entrance façade long ago attracted the pencil of travellers. It is curious to notice the contrast between the doorways in the south of Spain, barred only by a delicate wrought-iron screen, and the doors here, which are not only massive enough for a fortress, but are studded with bolts with large caps, generally in the form of shells. These iron-bound doors set in solid walls with few windows give to each house the aspect of a donjon keep, — and so they were built to be.

Madrid I have kept for the last simply because, being the least in architectural interest of Spanish cities, I might leave it out if necessary. The capital of a land strewn with glorious monuments of the past, it stands as barren of interest and as careless of the inspiration about it as if built on one of our western plains. Only founded in the middle of the sixteenth century, its oldest monuments are the vilest rococo churches, and its newest the wretched imitations of French *maisons-à-loyer*. The palace is the only building worthy of notice, and this though commonplace in plan and artitecture — it was built by an Italian in the eighteenth century — is really fine in its proportions, and so unpretending in detail that its effect is grand and dignified. Its situation is fine, upon the brow of the high plateau on which the city stands. From its rear windows the view is over plains below and down the little river Manganares to distant snow mountains; it is like a vast royal park, for hardly a house is visible. The interior is every inch a palace, — almost theatrically so. There is the traditional prodigality of statues, marbles, velvets, gilt bronzes, tapestries, etc. The throne-room is truly magnificent with its crimson wall-hangings, against which are relieved dark bronze statues on black marble pedestals. These and rich marble tables and rock crystal chandeliers are reflected in enormous looking-glasses. Over all is a magnificent ceiling by Tiepolo, whose painting, however rococo it may appear in churches, is here entirely appropriate to the luxury beneath. A man whose facility knew no limits, Tiepolo, although at times a tremendous worker, was really but an elegant trifler, owing to his surroundings and his country; yet his color makes those who are familiar with his best work pardon him his want of discipline. In this ceiling, as in the celebrated staircase at Wurtzburg, he is at his best. To the delicate tints and rich shadows of Veronese, to whom his contemporaries compared him, he adds the purely decorative style of drawing and grouping which distinguishes his talent.

From decorative painting to a word on the Madrid gallery is a natural and almost necessary step, for to all artists Madrid can have but this one interest. Familiar with the Valasquez of other important galleries, it needed but a glance at his work here to show me that my ideas of him were entirely wrong. I had thought his pictures careful, learned, and rather dry; I found him here the most careless and dashing of painters, overflowing with that emotion of art which the French call "temperament," and his later works full of wonderful short-hand expression, which his great power alone saved from being pure *chic*. It is easy to recognize whence Carolus Durand has drawn his inspiration and his exaggerations, which to those who have not been to Madrid seem so original. Bonat must be equally indebted to Ribera, who, also, can only be appreciated in Spain.

Burgos, as either the first or the last place seen in Spain, will be sure to be remembered by the traveller, and its splendid cathedral will be found worthy its great reputation.

On the whole, I think the value of Spanish architecture has been undervalued. Their buildings are not models to be copied, but much may be learned even from their faults, nearly always those of exaggeration, and all that is purely Moorish is full of hints and ideas capable of adaptation, of which thus far little or nothing has been made. Their iron-work and carving, as I have hinted, is remarkable both in North and in South Spain. I have confined my letters chiefly to Moorish architecture, as my main object was to trace the developments of Arabian architecture. Northern Spain is even more rich in motives which can be applied directly to our architecture. If some one would do for the early Renaissance in Spain what Mr. Street has so well done for the Gothic, our architecture would be the richer for it. Mr. Street profoundly despises any but Gothic art, but I am sure in avoiding southern Spain in all of his numerous trips, because as he says the Gothic there must be tainted by Eastern influence, he gives a most unjust idea of what really may be found there. R.

NOTES OF EXPERIENCE AND INEXPERIENCE.

37. Echo. — "Provincial" has a tough subject in his echoing church. Proportion and material are all about as bad as possible, and it is unlikely that any number of wires would do it any good. To carry a new ceiling all through, level, about fourteen feet from the floor, would help very much; or if the present ceiling could be cleared away and the plan opened to the under side of the roof-boards, the echo would probably be cured, and the loss of power in the sound would not matter in so small a building, though the extra cost of fuel for heating would be something I doubt if anything less radical than one of these expedients would help much, unless the room were padded all over. C.

NOTES AND CLIPPINGS.

Concert Rooms. — Mr. Cecil J. Saunders, in a paper read at a late session of the Musical Association, in England, on the Construction of Buildings, considered in Reference to Sound, made some very interesting statements and advanced some curious theories. Glass being one of the most elastic of sound reflectors, he was not surprised to find, when listening to a concert at the Crystal Palace, that the echo of one note returned to him at the same instant that he received the next note direct. He said that light had a remarkable modifying influence on sound, a statement which was corroborated by gentlemen who took part in the discussion which followed the reading of the paper, although the general opinion seemed to be that the cause lay not in the light itself but in the heat produced by it. Mr. Saunders then described the hall that he would have built to contain five thousand auditors. It would be a square room with rounded corners, and the orchestra in one of the corners. The audience would face the orchestra, and would thus look towards the converging walls. The number of performers provided for would be 700, as this was probably the limit of really good work, the orchestra seats rising tier above tier into the angle of the building. The organ should be chiefly below the orchestra, so as to allow of a low ceiling. By placing the orchestra in the angle of the building, very few of the audience can receive an echoed sound. The seats for the audience should be circular, so as to give every one a direct view. The floor should rise gradually towards the back of the room. The best material for the ceiling is wood. Ordinary plastering is one of the most perfect non-conductors of sound used in building. Zinc would be nearly as cheap, and perhaps even more efficacious than wood. The walls at the back of the orchestra should be covered with looking-glass, which has a strong reflecting power for sound. These glasses, however, should not be bedded in flannel as usual, but allowed to vibrate with every note. Boarding or cement would be best for the rest of the walls Cement is hardly resonant, but it reflects sound well. Stone would do better, but its cost is too great. No doubt a good deal of the resonance of cathedrals is due to the surface of smooth and hard stone inside them. For quartet performances, a movable screen behind the players or singers might be arranged so as to reinforce the sound in its forward direction. This screen should be of two thicknesses of wood with a sounding-board at the top inclined slightly upwards. Empty and half-empty rooms always echo, so that the best way of avoiding an echo is by low prices and a good programme. When there is a certainty of a small audience in a large hall, heavy curtains should be hung from the ceiling, so as to reduce its size.

The Origin of Doric Architecture. — First let us do justice to an erroneous conception of the origin of this Doric art. We have gone on repeating everywhere, in big books and little, basing the assertion on I know not what original premise, a premise more sentimental than critical, that the architecture of the Greeks — moreover the statement applied only to the temples, as if the architecture of a people were shown only in its religious edifices — was derived from the wooden hut. Unfortunately, if by setting about it with thorough earnestness certain similarities between the Parthenon and a wooden structure can be established, the matter becomes more difficult if we seek the edifices which have preceded this, such as the temples at Selinus or those at Pestum. It would be strange and contrary to all the laws of affinity if the origin of a style of architecture should be more apparent in proportion as the example is farther removed from its cradle. But there needs a vivid fancy to detect in a Doric building in stone, of an early epoch, anything which recalls the art of the carpenter. Just as the elementary structure of wood declares itself in Ionic architecture, just so much is it lacking in Doric architecture. — *M. Viollet-le-Duc in L'Art.*

The History of Greek Art. — It is said that Professor Overbeck, in preparing a third edition of his work, Geschichte der Gricchischen Plastik, has found that his theories must be changed so considerably in order to conform to the facts brought to light by the excavations at Olympia, that it will be necessary to re-write much of it.

The Frauen Kirche at Nuremberg. — A correspondent of the *Athenæum* writes: "The Frauen Kirche at Nuremberg is in the hands of the 'restorers,' both inside and out; it is stripped of every bit of ornament to the bare walls. The work of restoration will occupy five years. The choir of the Stifts Kirche at Stuttgart is likewise in the hands of workmen, and new glass windows, with superabundant yellow tints, have been inserted."

Cemeteries in Paris. — What to do with their dead is a question that is at present being discussed by the Parisians, who may well be alarmed at the insanitary condition of their graveyards, which are sources of constant danger, and in event of a serious epidemic breaking out could not fail of being sources of infection. About forty-five thousand corpses, large and small, have to be disposed of each year, so that it is not difficult to understand that the soil of the present cemeteries is "saturated," as a French paper has it. Two methods of meeting the difficulty are suggested; one cremation, the other the establishing at Méry-sur-Oise of a necropolis which shall replace all the cemeteries, old and new, of Paris. Together with this would be established a special railroad service, *chemin de fer des morts*, having a terminus in the city, — the designs of which, by the way, would offer architects an unusual opportunity, with its funeral cars and engines, which, as there are at present nine grades of funerals, each of which requires a distinct paraphernalia, would require extraordinary accommodation and would call for no mean outlay by the state. This scheme, which has much to recommend it, is opposed by the great railroad companies, and by the parish authorities generally.

Si Monumentum Quæris, Circumspice. — Mr. William Strickland, the architect of the capitol at Nashville, died in 1854, before the building was finished, and in compliance with his expressed desire his encoffined body was built into the walls of the building.

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THE burning of a tenement-house in Brooklyn last week repeated with little variation the lesson of that in Boston a week before. The conditions were essentially the same: a three-story wooden house with a single staircase, to which, as in the other case, it is believed an incendiary set fire; no fire-escape; and all the occupants of the upper stories injured more or less seriously, though happily none of them killed outright this time, in jumping from the windows and roof. That New York and Boston are full of houses just as dangerously built as these, and occupied in the same way, is acknowledged, and undoubtedly other large cities are like them. Existing building laws in both cities, imperfect as they are, call for precautions which would in a considerable degree offset the dangers, although fire-escapes and restrictions on lodgers will never make a dangerous building a safe one. The immediate difficulty is that the laws as they exist have not been, and possibly with the existing machinery could not be, properly enforced. Houses are continually built under permits for one use and occupied for another, or planned ostensibly for a given number of families and sublet to twice as many; or the precautions inserted in the plans to meet the law are omitted in the building when the inspector's back is turned. As for the fire-escapes, required as they are by building ordinances, they hardly ever exist. Inspectors complain that it would require a much greater force than they have to see that all the provisions of the laws are duly observed, and it is difficult to refuse to believe them. Even to keep watch and record of the new tenement-houses as they are built, and to insist on their fulfilling the law, requires a great deal of watching and many inspectors, now that circumstances have turned so much of the building effort of these dull times in that direction. To insure that the many thousands which already exist are put into the proper condition is a more difficult duty, and to see that their ever-varying tenants do not sublet and crowd them beyond what is allowed is yet more arduous.

THE *Evening Post* reports that the force of fifty inspectors, which has been at work in New York since the first of August, making a special examination of the tenement-houses in that city, has already done half its work, having examined nearly all the houses in the lower half of the city. They have visited more than thirteen thousand out of the twenty-five thousand which the city is estimated to contain, and these are the worse half, inasmuch as they are in the older and most crowded quarters. A plan of each, with a description of its condition, is filed in the Sanitary Bureau. The average number of families in each house is found to be six. It appears that even in the face of the recent stirring up of the tenement-house question and movement for reform, houses of this class are building which set the law at defiance, and whose plans have not been submitted, as required by law, to the the Health Department. The inspectors have made plans of these houses, and as soon as they are occupied the owners are to be prosecuted. This enormous work of registration once accomplished, — and if it is adequately done its progress certainly shows admirable activity, — the greater but necessary task will remain of reducing these almost innumerable houses to conformity with the laws, which doubtless the greater part of them now violate in one way or another, and of maintaining them in proper order.

As for the disasters we have just recorded, so long as the habit of building among us is what it is, we shall be liable to them. When a year or two ago a similar tenement-house burned on Shawmut Avenue in Boston with fatal effect, the people of that city were much excited for a time, the coroner's jury urgently recommended a more careful supervision, an increased force of inspectors, and the reasonable precaution of requiring fire-proof stairs to be put into such buildings; the newspapers complained that nobody was made accountable for the mischief, — and things went on as before. Of the need of holding somebody responsible for injury that follows a violation of law there can hardly be two opinions. It is clear enough that owners are not disturbed by the fear of losses which, if they dread them, they can easily and cheaply transfer to the insurance companies, nor by any considerations of danger to their tenants. The legal restrictions should, therefore, be either abolished or enforced by adequate penalties, and the penalties to be adequate should be heavy and inexorable. But in both the former and the last of the Boston cases it appeared that there was a plain violation of law on the part of the owner. In the case of the inspectors, the interests at stake are too serious to be safe in the hands of any nerveless administration. If inspectors neglect their work, or allow themselves to be easily evaded, public safety requires exemplary punishment for them; and if dereliction from duty were as offensive to our people as offences against party, they would get it. But since they ought to be held to account for neglect of their work, they ought to be enabled to do it thoroughly; and to do it thoroughly would require undoubtedly a considerably larger force of inspectors than our cities provide, and a severer administration than our people, except under occasional excitement, are accustomed to demand, as well as greater expenditure than they like to provide for. There is no doubt that in our policy of letting people build pretty much as they please, and then assuming to protect them and ourselves from the evil consequences of it, we commit ourselves to a very difficult and costly system. But so long as there is reason for the laws as they exist, there is reason to enforce them. When the community can be educated up to the point of beginning at the beginning with a better system of building, the work of securing ourselves against danger will be greatly lightened. It is a great deal easier and cheaper to see that houses are properly built than to make people live in them carefully after they are built. At present the staircase is their most vulnerable point, — the opportunity of the incendiary and the peril of the inmates. Better building, with less dependence on constant inspection, is our best refuge.

NEXT to actual larceny of plans the most pronounced case of architectural thieving which we have seen brought out as a public example is that for which Mr. David S. Gendell, of Philadelphia, architect and builder, seeks redress. He had built himself a pair of houses which, as appears from his complaint, he desired, with a feeling which the more earnest members of our branch, at least, of his profession will share, "should be a specimen of his artistic skill, and should not be a mere copy of other houses." The fruit of his artistic skill was lucky or unlucky enough to attract the liking of a Mr. Orr, who is his fellow in the other branch, being a builder, and Mr. Gendell was soon annoyed by persons who, in spite of his prohibition, persisted in entering his grounds and making measurements and drawings of the porch which he had put before his houses. Presently he found his porch duplicated on the front of a pair of houses which Mr. Orr was building a few blocks away. Mr. Orr, when remonstrated with, replied with unblushing confidence that he was in the constant habit of appropriating other persons' designs, and that he should finish his porch. Mr. Gendell has thereupon applied to court for an order to restrain Mr. Orr and the owner of the buildings from continuing the porch, and to compel them to remove it, on the ground that the design was obtained from him surreptitiously, illegally, and by trespass. Most architects are more or less qualified by experience to sympathize with Mr. Gendell's trouble, and to recognize in Mr. Orr's proceeding one of the several ways in which astute and not over-scrupulous people manage to get the benefit of an architect's services without paying him for them. We are all familiar with the owner who employs his architect vicariously by sending his builder about to copy what the architect has done, or with the inconsiderate client who hastens to one architect with a request to copy the work of another, and with the accommodating builder who saves his patron or himself the expense of

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plans by cribbing them from an architect with whom he has worked, or by modelling his house on some other man's. The remedy is not so obvious. It will be a matter of interest to the profession to note the action of the court. We hardly see what resource is open to aggrieved architects in such cases, except in an action for trespass, since the courts have not yet, so far as we know, recognized any property in designs, except when they are embodied in copyrighted drawings. We should have our misgivings, if the case went before a jury, as to the amount of damages which the plaintiff would recover. Against the copying of executed work through the eye we may never be able to guard, and the *American Architect* has never thought it worth while to argue for protection against it in ordinary cases. But it would be well, certainly, to put a check on such flagrant meanness as seems to be illustrated in the case before us, if it is possible.

The Boston newspapers have been more or less occupied of late with the treatment of the new Back Bay Park in that city, and especially of the entrance to the park from Commonwealth Avenue. A correspondent, whose letter we print on another page, calls our attention to this matter, and makes the timely suggestion that the design of this critical part of the scheme should not be fixed without very careful study, nor without referring to architects for suggestions as to the architectural treatment of the surroundings. We must modestly disclaim the possession of any voice that can be called "authoritative" in such a question. If we had one we should wish to think carefully before we raised it to advocate any particular solution of so difficult a problem. We may mention, however, one or two points which we think are to be borne in mind in considering it. Unquestionably the Park Commission is bent upon doing the best it can for the beauty as well as the convenience of that part of the city which is put into its hands, and it could not have done better than to choose Mr. Olmsted for its counsellor. But it is impossible without damage to dissociate the laying out of the park from that of the adjacent streets, as, indeed, the care which the Commission has bestowed upon its plan shows; and it is equally dangerous to study the laying out of such a conflux of important avenues without an eye to their ultimate architectural treatment. The obvious way, as it is with us the common way, is to lay out the streets as they will lie easily on the plan, and leave them to be built up, as chance may direct, by the individual owners of adjacent lots. Nor would it be practicable in this country to exercise any considerable control over the kind of buildings private owners put upon their land, however much the city might gain in general elegance by it. Nevertheless the architectural character of important points might be determined by the choice and design of some commanding features, and the work of private owners made subordinate to these. For this intelligent devices of all kinds are worth considering, and, naturally, none so much so as those of capable architects, whose business it is to plan for like exigencies.

Of the approaches to the park that from Commonwealth Avenue will probably be the most important, and at that approach, on the other hand, should naturally be the crowning interest of this ambitious highway; so that here we have an opportunity and a need for effective treatment, the like of which will probably not occur in the city for some generations. We are inclined to think, as many people do, that to run the avenue across the end of the park in the way the Commissioners' plan proposes is not the best thing that could be done. So many modes of treatment are possible here, so many ways of carrying them out might be suggested, and architectural handling must play so important a part in the result, that architectural study is very necessary, and a competition of architects, as proposed by our correspondent, would be peculiarly appropriate. The problem might be set before architects in such a way as to be of rare interest to them, and we should be surprised if in the present leisure of the profession the most capable architects did not gladly avail themselves of any reasonably presented opportunity to offer suggestions. We should of course be very glad to publish good designs for this improvement, but the invitation of public authority would be far more successful in procuring them than ours. We do not know how far the powers of the Park Commission go in this direction, — how much authority they have to consider the treatment of the streets of the city outside the limits of the park, or to expend money in securing designs. The Commission has at least power to make recommendations, and since the park and the abutting streets cannot be successfully considered apart, the power to decide upon their treatment might reasonably be lodged in the same hands. A competition to be successful would involve some expenditure, to be sure, but a small one in comparison with that necessary for the labor of execution. The essential aim in providing a park is to secure beauty, and this requires study and technical skill. It is fair, therefore, to remind tax-payers that designs are as essential to the work as loads of stone and gravel, and as well worth paying for.

The New York papers, on their part, have lately complained with much bitterness of the neglect and injury which the Central Park has suffered since the removal of the former board of commissioners, and the loss of Mr. Olmsted's oversight. The old nicety and freshness which distinguished the park are wearing off for want of protecting care, and a rubbishy look is stealing over it. The new work, not done with the same thoroughness or finish as the old, shows the marks of negligent superintendence. Carefully studied effects are being obliterated by neglect or wanton interference, and both natural and architectural features begin to show deterioration. In some places a neglected growth has swallowed up spaces that were meant to be open; in others the original studied planting has been wilfully sacrificed. The most conspicuous and mischievous destruction has been at the entrance on Fifth Avenue, where a row of trees that divided the drive, and made a fine double vista, were one day cut away without warning, and, it is said, without notice to the chief gardener, at the instance of persons who wanted better opportunity for fast driving. This, we take it, is a not unnatural result of taking the charge of the park out of the hands of men whose tastes, professional feeling, and pride were all enlisted for the preservation of it, and of putting it into politics.

In a communication in another column, Mr. George C. Mason, Jr., whose article on the Old Mill at Newport we lately noticed, enforces the theory of the fireplace. We have not espoused any side in the controversies over this building, not having sufficiently minute knowledge of the structure to warrant us in going beyond the queries we have already suggested. But it may be noticed that Mr. Mason does not adduce any evidence that the niche in the wall of the mill had ever been used as a fireplace, confining himself entirely to *a priori* arguments, — a theory based on which is good, as the saying goes, till another is advanced. His arguments would be more applicable, it seems to us, to a structure built round a preëxisting floor than to one in which the beams could be placed to suit the masonry, wherever the builders chose. To us the difficulty of imagining any other use for them is the chief reason for thinking the niche and flues to have served for fireplace and chimney, for which, if they were so intended, they must have been a disheartening failure; while their manner of construction was not quite such as was employed for such uses, so far as we know, in either the eleventh or the seventeenth century, — clearly not the latter. Mr. Mason's discussion will interest our readers, and his main point, that, whenever built, the structure was built essentially as we see it, seems pretty clearly made out by his examination, with a fair probability in favor of the later date.

THE SEWERAGE OF THE SMALLER TOWNS.[1] II.

The use of the Field flush-tank promises to lead to some radical modifications of sewerage practice. Briefly described, this tank is a vessel of any desired capacity, placed at the head of a drain or anywhere in its course, and receiving the outflow of several houses, or, better, where a small contribution from the public water-supply can be secured, receiving pure water. When it becomes filled, its stationary, automatic siphon comes into action and discharges its whole contents with great rapidity, producing a flow adequate to the thorough cleansing of the drain or sewer into which it discharges.

The tank being discharged, air is admitted to the siphon, and it remains inoperative until its reservoir is again filled, when a second discharge takes place. If properly protected against the admission of grease and coarse matters, this tank needs little, if any, attention. It is always on duty, retaining all that comes to it until full, and then discharging its contents with a cleansing flow. The contributions to it may be copious or slight, without affecting the regularity and promptness of its action.

I am not prepared to say that with the aid of the flush-tank it

[1] A paper by Colonel G. E. Waring, Jr., read at the Social Science Convention lately held at Saratoga.

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will be safe to do entirely without man-holes to give access to the sewers, but I *believe* (and I have some experience upon which to found my belief) that it will be safe entirely to avoid these expensive appliances; or, at least, to place them only at such long intervals as may be necessary to supply air for the ventilation of the sewer.

Aside from its sanitary advantage, the use of this small size of sewer will be very much cheaper than that of the large sizes now employed. I regard the economy, however, as less important than the cleanliness and rapid delivery which the smaller size must secure.

Not the least of its benefits is to be sought in the more thorough ventilation which even limited ventilating appliances would effect in a small pipe than in a large one, for the reason that the amount of air to be discharged is very much less; that the rapidity of movement of an equal quantity of air is much greater; that the air-space above the flowing stream is subject to a much greater fluctuation in proportion to its volume; and that from its smaller volume it is more susceptible to the impulse of differences of temperature in the water flowing through the drain, and of friction.

The adoption of small and cleanly flushed sewers, furthermore, is of importance in the case of sewers which deliver into harbors or into rivers. It is an accepted standard of extremely foul sewage that it kills or drives away the fish which existed before the waters were contaminated. Such contamination is due, not to the introduction of organic matter, but to the introduction of organic matter in an advanced stage of decomposition. Leaving out of the account the effect of the outflow of chemical works, etc., recent sewage, — the fæces and kitchen waste of dwelling-houses, etc., — so far from being injurious to fishes, is welcome food for them, and all who have watched the outlets of house drains into streams of water must have noticed the avidity with which all their solid contents are devoured. We are not now considering how this would affect the value of the fish for human food; but even on this point, if we recall the diet of the barn-yard fowl, we need not be too severe in our condemnation. It is undoubtedly true, that if the whole of the organic wastes of the town could be delivered into a stream within twelve hours of the time of its production, the fishes of that stream would become its complete and efficient scavengers. Not relying, however, upon this means of disposing of town sewage, we have to consider the whole question from an engineering point of view.

The investigations made years ago in many of the larger towns of England where water-closets are used, as compared with those where water-closets are not used, showed, chemically, very little difference in impurity. This has long been taken as an argument for paying the same regard to street waste that we do to household waste. But this conclusion implies a condition which is never admissible in any well-regulated town; that is, that the streets shall be allowed to become as offensive as the water-closets. What I desire to impress upon your minds is the obvious fact, that in one way or another the surface of the streets should be kept absolutely clean, and I would ask you to consider favorably my opinion that they may be much better cleaned by other means than by washing their dirt into elongated cesspools underneath them, and allowing it there to remain and decompose, to our great injury.

The street dirt and storm-water being set aside, we get rid of the chief engineering difficulty of the whole problem of disposal, which is *a great variation in the volume of the sewage*. The outflow of private houses, hotels, factories, etc., is pretty nearly uniform in its quantity. It varies but little from day to day, and scarcely at all from week to week. If, on the other hand, we attempt to admit floods of rain-water into our system of sewers, the volume is subject to fluctuations so enormous as to upset all our calculations. Ordinarily the flow will be far too little properly to employ the works which we have prepared to deal with it; at other times these will be taxed to their utmost, and whether our means of disposal be agricultural or chemical, we are sure to have too great a volume at times, and a relatively insignificant quantity as a rule.

The importance of this branch of the subject when sewage is delivered into water-courses is trifling, but the time is coming, and in some places it has come already, when the rights and requirements of our neighbors further down stream must be respected to the extent of purifying our sewage before we deliver it into water which flows to them.

These troublesome fluctuations in the quantity of the sewage being eliminated from our problem, it is a very simple matter to make provision for chemical or agricultural treatment in such a way as to prepare for the gradual increase of outflow which will accompany an increase of population. The quantity with which we have to deal being a fixed one, it becomes a simple matter to adjust our works to the duty to be performed. It will then be easy to manage the question of river pollution, and we shall have saved enormously in the cost of construction.

For example, in the village of Lenox, in Massachusetts, it was found that the only stream to which the sewage could be carried was the Housatonic River, some miles distant, over a difficult country. To lay an outlet sewer to the Housatonic would cost much more than the whole fund available for drainage purposes. Storm-water being excluded from the sewers, it became easy, with the help of the flush-tank, to establish a system of subsoil irrigation in a field near the town, and the whole work was completed in a satisfactory manner for less than the expenditure that had been contemplated. It has been working steadily and regularly and well since its construction, several years ago.

At the Reformatory Prison for Women, near South Framingham, Massachusetts, the delivery of sewage was into a stream which found its way into the water supply of the city of Boston. The daily outflow is between twenty-five thousand and thirty thousand gallons. There was no means by which this could be carried to an unobjectionable river outlet without an inordinately large outlay. Had the amount of sewage to be treated been subject to such variations as occur in towns where rain-fall is admitted to the sewers, this would have been the only recourse. The quantity being practically uniform, it was easy and economical to establish a system of sub-irrigation disposal upon the limited grounds of the establishment, in such a way as to overcome every objection.

While on this question of sewage disposal it may be well to describe briefly the sub-irrigation process which is now promising such good results. The principle upon which it works is this: All soil has a very considerable power to extract and withhold organic impurities from water which passes through it. That is, all soils in their fresh condition are good filters, more or less good according to their composition and drainage. If a foul stream flows constantly through any soil, the accumulation of organic matter clogs it, obstructs its action as a filter, and makes it increasingly foul. The great purifier of all filters is the oxygen of atmospheric air. A mass of earth, which would become foul under an uninterrupted addition of organic matter, will become entirely purified by oxidation, if the same quantity of impurity be added in a short time, if it be spread over a wide surface, and if it be left for a sufficient time subject to the oxidizing process.

In the sub-irrigation system, as applied in practice, the outflow of the sewer or drain is caught in a Field flush-tank, and held there until the tank is filled. It then discharges itself into common agricultural drain-tiles laid only ten or twelve inches below the surface of the ground and having open joints. The discharge flows on through the various ramifications of the system of drains, leaking away at every joint, until the whole discharge from the tank has settled into the ground and has more or less saturated it. The water of the liquid settles down by its own weight to the drains or into the porous earth below, leaving its impurities attached to the surfaces of the interior particles of the earth. As the water of saturation settles away, fresh air enters the soil, and the oxygen sets up that slow combustion of organic matter which is its great purifying office the world over. In due time the earth has become purified, the flush-tank has again filled itself, and a fresh volume of sewage is delivered into the drains. This description is hardly more simple than is the process itself; and it must seem absurd to those who are not familiar with it, to suppose that it is capable of dealing with the troublesome problem of the purification of sewage of a town. I have come to believe that its capacity is almost unlimited, and I am sure that for those towns which may properly be called "village-cities," it offers almost universal relief.

The use of agricultural drains in this way was the invention of the Rev. Henry Moule, the originator of the earth-closet. The value of an intermittent discharge in the application of sewage to the soil is the suggestion of Dr. Frankland. The combination of the two was the natural outgrowth of observation and ingenuity.

I believe that the system was first introduced in this country in a systematic manner, in the grounds about my own house at Newport, in 1870. It has gradually worked its way, as experience has indicated its capabilities, until, in 1876, I did not hesitate to apply it for the whole sewage of Lenox; and it is now accepted, I believe, by all who have given attention to it, as being entirely reliable, economical, and efficient.

We must not forget the very important question of the ventilation of public sewers, which it seems to me is less adequately treated than any other branch of the work to which attention has been given. Concerning the large sewers of cities opinions vary, and there is no occasion for me to express my own here, further than to say that I regard what are called "perforated" man-hole covers as an ineffective attempt to carry out the system of man-hole ventilation which is so much and so justly commended. Nothing less than a coarse iron grating whose spaces are at least equal to its solids will answer the purpose.

Much reflection on the subject has convinced me that, were it possible to enforce the regulation, no means of sewer ventilation can be nearly so effective as that of connecting every house-drain which joins it, without the intervention of a trap anywhere in its course, with an open soil-pipe, reaching above the roof of the house. To be efficient this system must be compulsory and universal. If the authorities of a town have the right to assess private property for the construction of sewers, and to establish the conditions under which private persons may connect with them, they surely have the right to make it one of those conditions that this open ventilation shall be given, and to impose as severe penalties as may be necessary to protect itself against any interference with the ventilating action of each connection.

Could this system be carried out in connection with the small sewers which I have described, we should have a small volume of air contaminated only by the decomposition of the slight sliming of the walls of the sewers in open connection with the atmosphere at the

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outlet or outlets, and at the occasional man-holes, and through a tall and somewhat heated soil-pipe in every house along its course, connected in such a manner as to secure a constant and efficient change of the atmosphere of the whole system of sewers and connections.

In judging of the advisability of this system we must dismiss from our minds the sort of air with which we are familiar as escaping from the limited vent-holes of the foul public sewers common in our cities. The sewers which I am now recommending will at no time contain organic matter in an advanced stage of decomposition. They will contain at no point any accumulation of solid matter. They will be frequently flushed to the height at which their current may deposit a slimy coating, and they will be constantly swept by a movement of fresh air supplying oxygen for completing an immediate decomposition, rendering putrefaction and fermentation impossible, and diluting and removing, as fast as it is formed, the slight amount of resulting gas. They will not be sweet. Their contained atmosphere will not be fit to be admitted into a living-room; but they will be so infinitely less foul than the common sewer of the present day that there will be no objection to discharging their air above the roofs of our houses.

I venture the opinion that within ten years this system of sewerage and sewer ventilation, or its equivalent, will be universally accepted as the best, at least for our smaller and more sparsely built towns.

I have still a word to say concerning the removal of soil-moisture, and the thorough under-drainage of the sites of our towns. I fully endorse all that has been said in its favor, and I fully accept all that Dr. Bowditch and others tell us of the enormous and fatal disadvantage — so far as our national disease, consumption, is concerned — of its absence. I only protest against the use of public sewers for this purpose. They may properly afford an outlet for water brought to them by suitable under-drains, but they should never, under any circumstances, act as absorbent drains themselves. Where the inclination of the surface is sufficient it is an excellent plan, so far as possible, to lead the outflow of under-drains into the flush-tanks by which the sewers are to be cleaned. Where this is not possible they may be led to man-holes, or to special branches of the sewer, the connection being so arranged as to prevent sewage from flowing back into them and leaking out through their open joints into the soil.

As I am speaking upon my own specialty I shall, I trust, be excused for attaching greater importance to it, and for according it wider advantages than are recognized by those who are less familiar with it. I would not underestimate the benefit of a public water-supply, but I think that we may, to a certain extent, weaken the *sanitary* argument in favor of introducing extraneous water for the supply of a village. This sanitary argument is based upon the contamination of drinking-water wells by infiltration from private vaults and cess-pools.

I would abolish absolutely and totally, by compulsory public enactment, every form of private vault and cess-pool, and make sure that all outflow from every house, good or bad, rich or poor, should be carried immediately quite outside of the town by a system of perfectly tight and impervious sewers and drains. I would leave nothing within the limits of the town which could act as a source of well-water contamination. The cause being removed the effect must cease. There being no longer a source of foulness in the soil there will soon be no contamination of the water.

In all cases the introduction of sewers must follow if it has not preceded the introduction of a public water-supply. In some cases, at least, the introduction of sewers would render the introduction of a public water-supply unnecessary.

I have now sketched, hastily, as one must on such an occasion, the general features of the plan of sewerage that I propose, and the leading reasons upon which the recommendation is based. I am sure that there are those in my audience who utterly disagree with the doctrines that I have advanced, or who doubt the soundness of my position. I hope that they will not hesitate to express their objections or their doubts, to the end that we may secure such light as comes of free discussion.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR A TOWN-HALL, UXBRIDGE, MASS. MESSRS. FERRY & GARDNER, ARCHITECTS, SPRINGFIELD, MASS.

The programme in accordance with which these designs were prepared called for a main hall capable of seating six or seven hundred persons, a public library room capable of holding five thousand volumes, a small hall, say 20 by 50 feet, for caucuses, and offices for the selectmen, town-clerk, and overseers of the poor. The limit of cost was fixed at $12,000. These designs were among the rejected.

NEW CUSTOM-HOUSE, ST. JOHN, N. B. MR. T. S. SCOTT, CHIEF ARCHITECT, DEPARTMENT OF PUBLIC WORKS, OTTAWA, CANADA. MESSRS. McKEAN & FAIRWEATHER, SUPERINTENDING ARCHITECTS, ST. JOHN, N. B.

This building covers a portion of the site of the custom-house destroyed by the fire of 1877. There are two stories of ten feet each, between the levels of Prince William and Water Streets, and three full stories above the former street. The four fronts are of freestone from the Dorchester quarries. The roofs are framed of iron and the floors made fire-proof with corrugated iron. Plaster of Paris and concrete are used, with wire netting to hold the plastering, all suspended from iron rods run through the centre of the joists. The two towers are for the "time-ball" and for repeating the shipping signals from Partridge Island, and for the "storm drum." The cost will be about $250,000.

STRASBURG CATHEDRAL, GERMANY.

The nave was finished in 1275, and the façade, begun in 1277, was a long time in finishing. Fig. 1 shows the western front, Fig. 2 the southern transept, finished *circa* 1200, with its fine transitional doorway, and Figs. 3 and 4 show interior views. See article "The Cathedrals of Metz and Strasburg," below.

THE CATHEDRALS OF METZ AND STRASBURG.

These ancient and stately edifices, which became partly ruinous before that of Cologne approached completion, have ever since the termination of the Franco-German war been in process of repair. For that of Metz a new roof is determined upon, for which the architects of the two provinces have been invited to compete, while the great gates of the Strasburg edifice are to be regilded by artificers from Paris. It is worthy of remark how many of the most celebrated European cathedrals are at present in a state of decay, more or less irreparable. The arches of Amiens are in danger, and its polychromatic decorations are rapidly vanishing from sight. The spire of Antwerp, even, had lately to be restored to save it from mouldering to destruction. At Asti recent restorations have destroyed the beautiful natural coloring of the stones. Saint Bavors, at Ghent, was only rescued from utter dilapidation a few years ago, while that of Troyes has been endangered by the very means employed for its conservation, — an iron girdling, which gave way beneath sudden atmospheric changes. It is to be feared, indeed, that many influences exist throughout Europe tending to the neglect and disintegration of these historic structures, as witness the state in which are left the bronze doors of Pisa, the pulpit of Ravenna, the balustrades of Rouen, and the towers, even, of Tournay, the most antique among the religious monuments of Belgium. Those of Ajaccio, Madrid, Chateauroux, Marseilles, Moulins, and Nantes are, indeed, scarcely more than so many new buildings erected on old foundations, though claiming to be dated with them. That of Metz, however, which the German government — arbitrary in matters of architecture, as in all else — has resolved upon re-roofing, possesses a particular interest. The work was originally determined upon, however, by a French government, simultaneously with that of Beauvais, and the scheme was that of a Frenchman, who exhibited his designs so far back as the year 1852, — a plan with two sections, including the choir, stalls, pulpit, high-altar, lamps, and decoration, in stone, wood, and color generally. Upon this last part of the subject a discussion has been in progress from that time to this, and is not yet terminated, whether the precedents shall be followed of Aix-la-Chapelle, almost stern in its severity; of Alby, almost pagan in its adornments of pyramids, porches, clock-towers, mosaics, painting, and sculptures; of Amiens, with its brazen-lidded tombs; of Auxerre, enriched with color down to its very crypts; of Chartres, with its gilded tables, bas-relief in stucco, and stained windows, or of Citta-di-Castello, with its enamelled pavements. Ultimately the resolve was adopted to preserve the original outlines and style, so far as they were known; and the German desire is, it may be said, to act upon the suggestions of the French architect. As for Strasburg, it would be an act, so to speak, of artistic impiety to depart from them. On the principal door are inscribed these simple yet impressive words, "In the year of Our Lord 1277, on the Feast of Saint Urbain, Master Erwin, of Steinbach, commenced this glorious work." Erwin died A. D. 1318, his son John continued his labors after him for a period of twenty years, then the task was taken up by John Hulz, of Cologne, who died A. D. 1449, nearly a century and a quarter after the laying of the foundation stone. All three belonged to the plebeian order, yet the noble chapter of Strasburg raised their monuments in the cathedral, an honorable custom of the age, not there exemplified alone. The three architects of Amiens are magnificently commemorated beneath its roof, though the history of their memorial is a curious one. Jean de Chelles is not forgotten in Notre Dame de Paris. At Toulouse the names are preserved of the artisan monks — "rectors of works" they were termed — who assisted in its building, and in the metropolitan church of Chartres are the tombs of its chief architects, Robert de Courcy and St. Ignaise. But at the general conference held upon this question at Paris, nearly forty years ago, the report of an architectural committee was submitted, the recommendations of which were: That the original outlines of the apse should be retained; that the Roman-Byzantine should be preferred before any purely modern adaptations; that the altar then existing — a marble slab, supported upon four dwarf columns — should be replaced by an altar of Oriental or Byzantine form; and that the stalls in the choir should be replaced by others of "a fashion less burlesque," with an episcopal chair "copied from the basilicas of Italy." Moreover, the apsidal arch was to be painted in fresco on a gold ground, while the cupola was to be similarly adorned, with groups of the Evangelists, and their respective attributes symbolized. These conclusions were not adopted in their entirety, because some peculiar theories of architecture prevailed at the Strasburg Congress. Some

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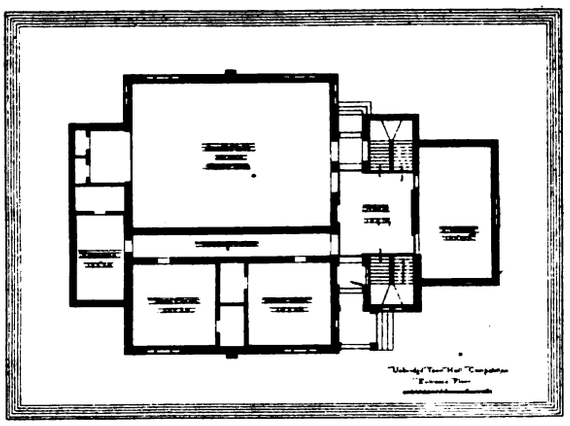

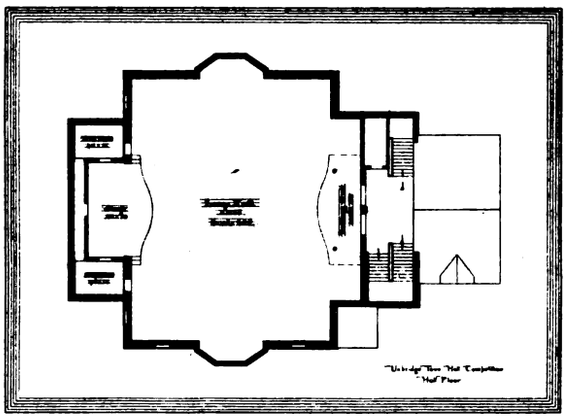

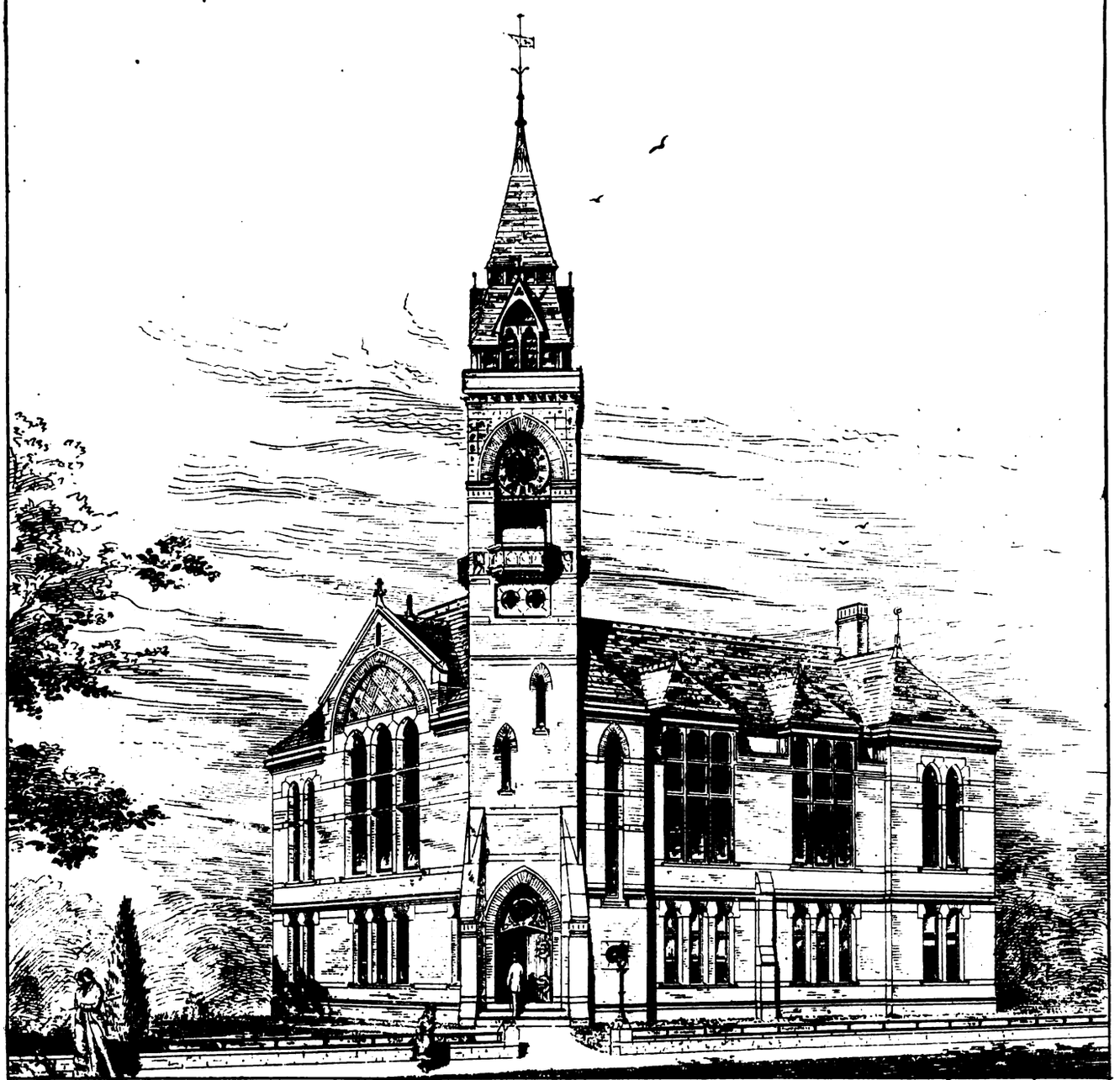

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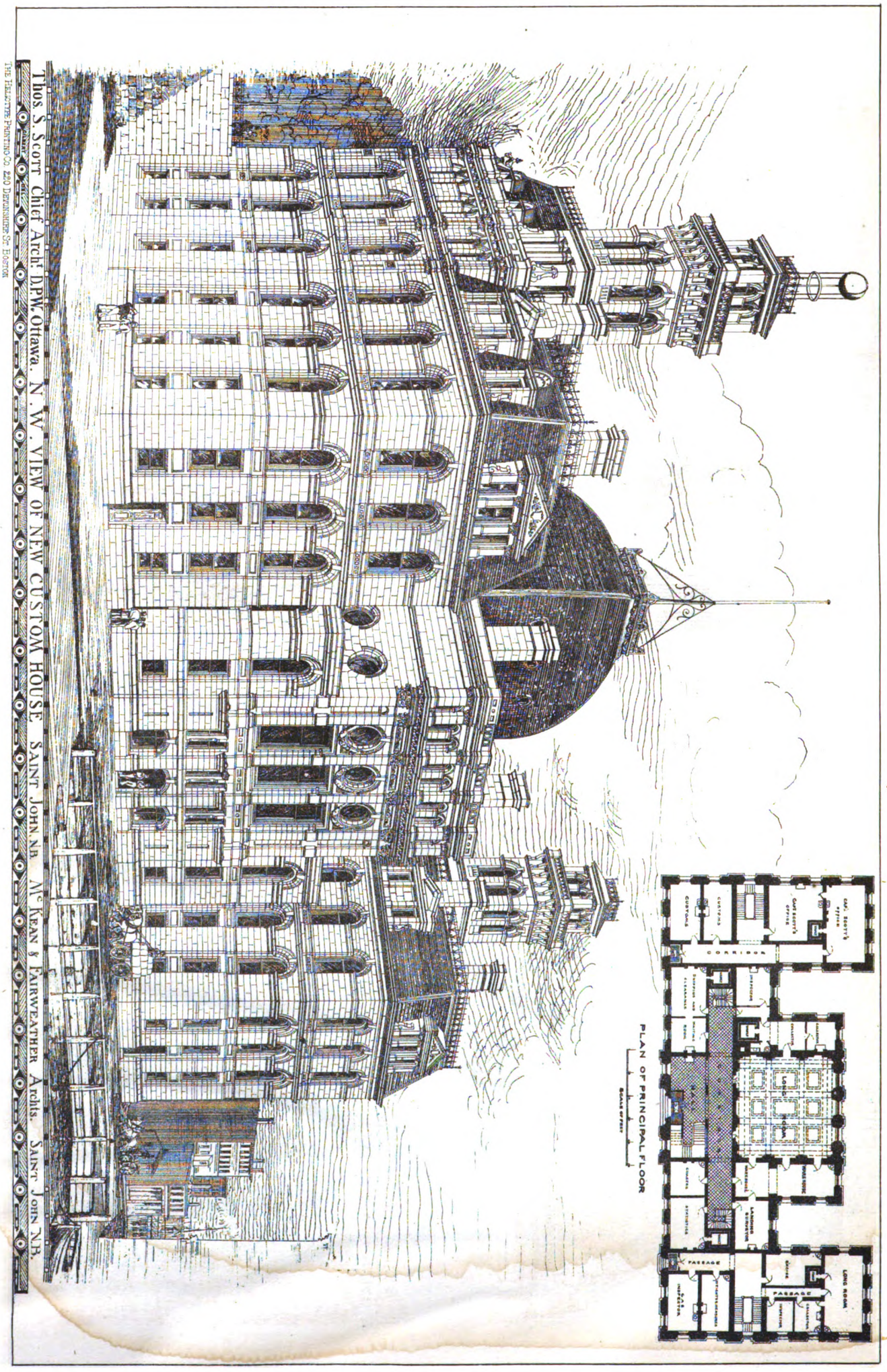

Thos. S. Scott Chief Arch.t D.P.W. Ottawa. N. W. VIEW OF NEW CUSTOM HOUSE SAINT JOHN, N.B. Mc KEAN & FAIRWEATHER Archts. SAINT JOHN N.B.

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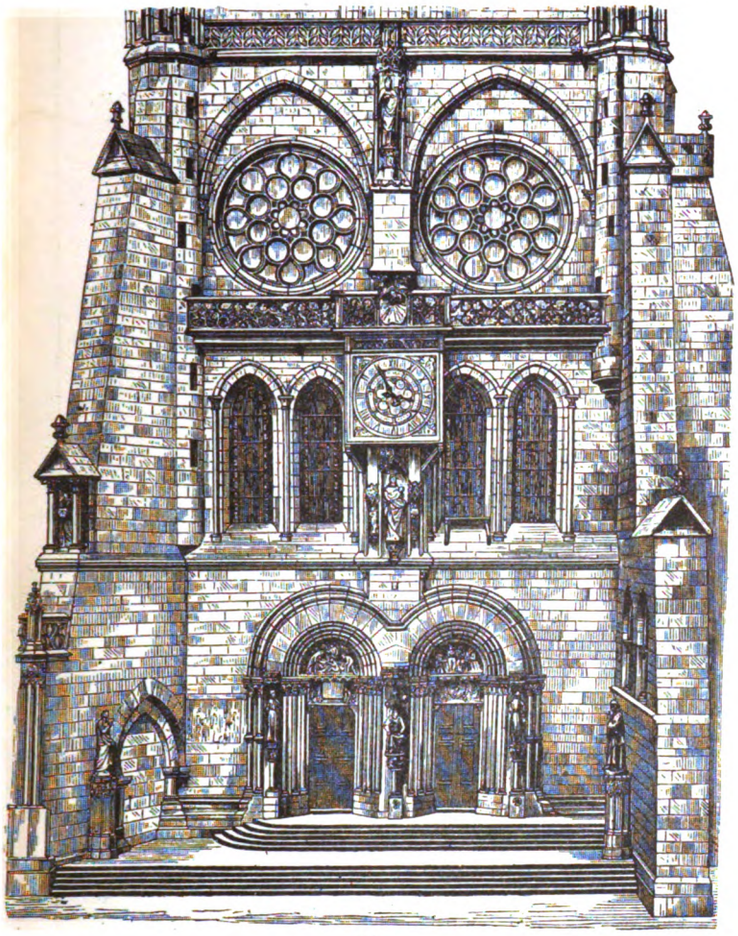

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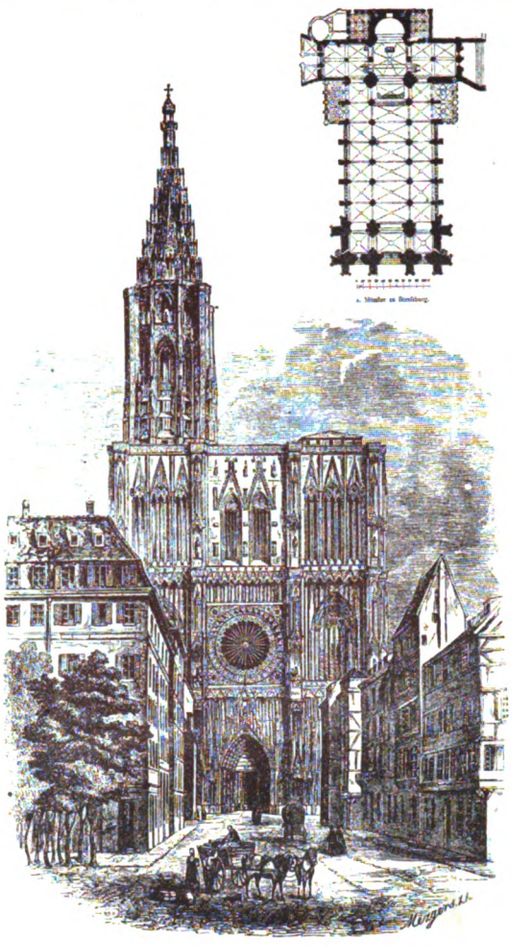

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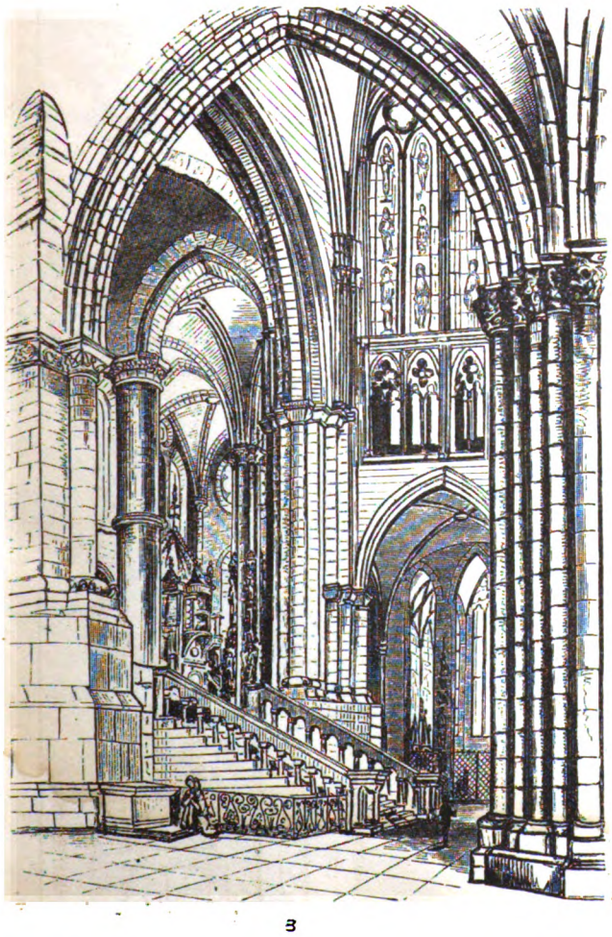

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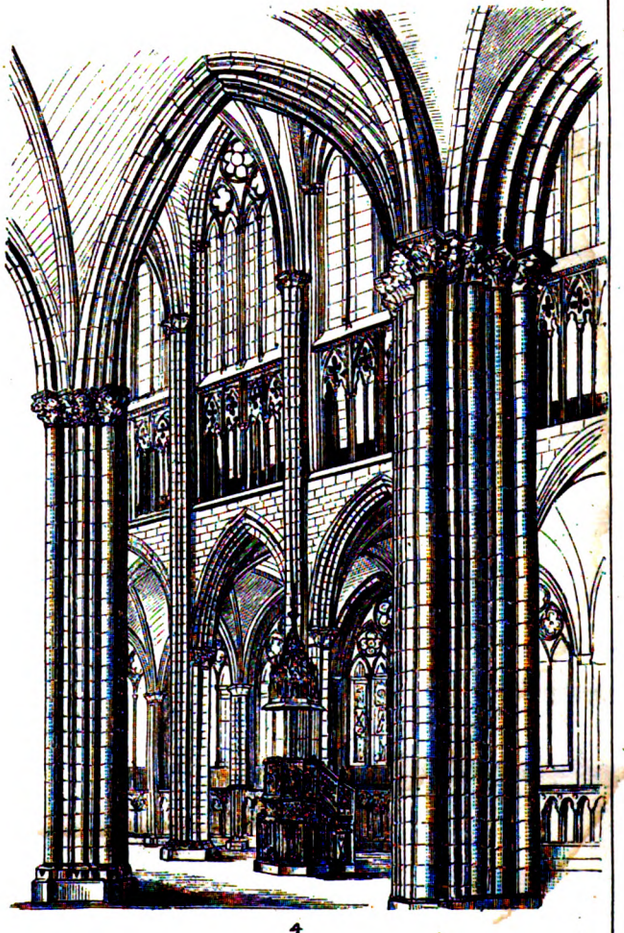

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STRASBURG CATHEDRAL

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Uxbridge Town Hall Competition.

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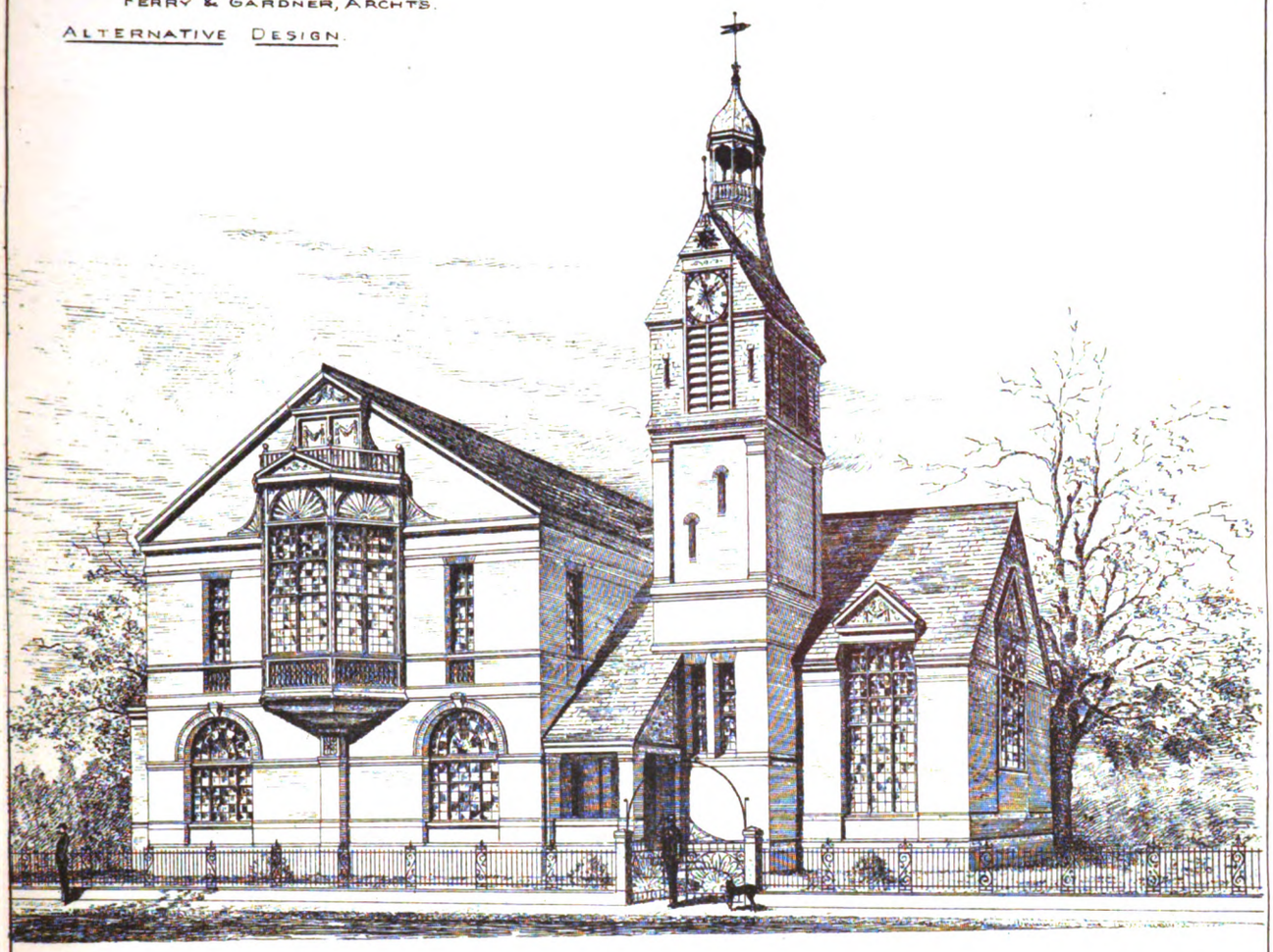
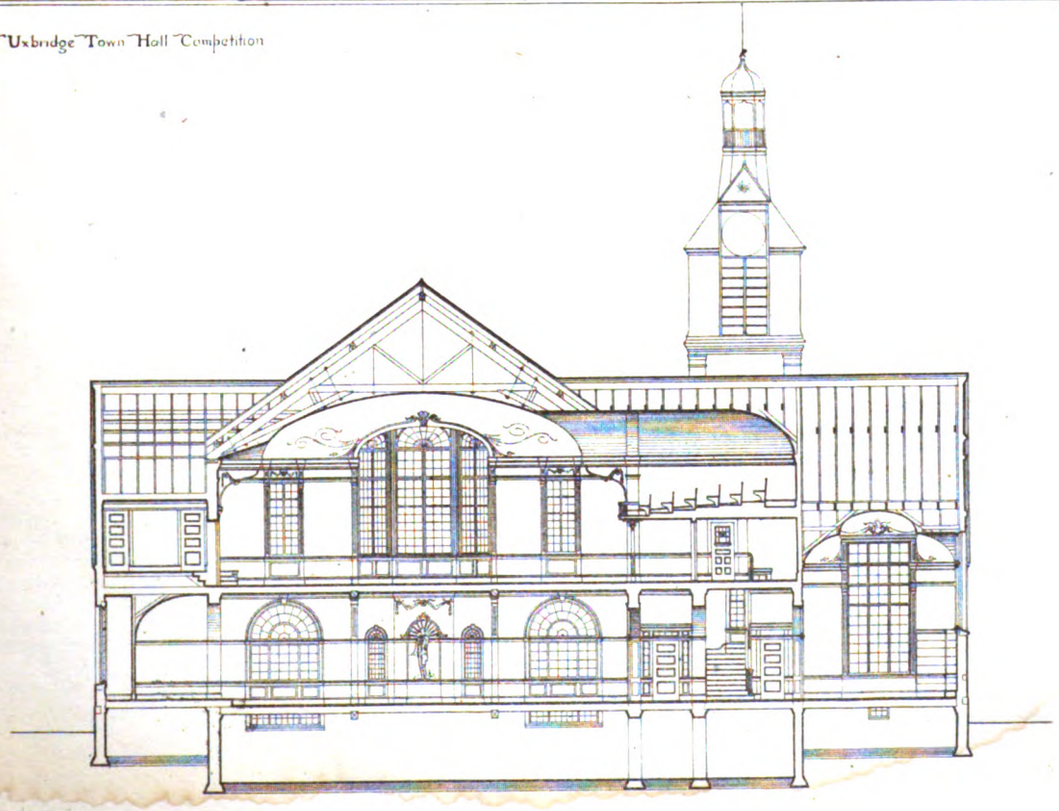
ALTERNATIVE DESIGN.



Uxbridge Town Hall Competition



Longitudinal Section

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of its members repudiated the Byzantine idea altogether, and pleaded for the style in vogue when the fifteenth Louis of France was king. Others thought that every Christian order of art should be represented in a Christian edifice; a few insisted on the Gothic, and every one is now aware of what the result has been. In relation to Strasburg Cathedral, however, the works now going on with respect to its renowned astronomical clock are curious. In one way or another the machinery got out of order several years ago, and not a few mechanicians of repute felt reluctant to meddle with it. The first of these constructions was accomplished in 1352; two centuries later an attempt was made, as most people thought with small success, to improve on the original model, and the experiments have not ceased to this day. A history of this marvellous clock, however, would require to be written by itself.

The progress of all these cathedral restorations, whether undertaken by the French or the Germans, has been singularly slow. Thus, the Chapel of the Nativity, though commenced more than thirty years since, is not thoroughly completed yet. No doubt it is an exceedingly intricate and beautiful work, involving a more elaborate employment of color and gilding, which had frequently to be suspended through the severity of the weather for weeks, sometimes altogether, and, indeed, many external causes have delayed the artists at their labors. As at Cologne, in fact, generations of them have passed away since the undertaking was begun. Of course, if we choose to be antiquarian, we can go back to the age of Clovis, to the days when ten thousand workmen assisted, free of wage, in the erection of this mighty shrine, simply "for the good of their souls," and so forth; but it is the structure under its latest aspects that has to be considered. The equestrian statues of Pepin the Little, Charlemagne, Otho the Great, and Henry the Fowler are comparatively new. So is the gigantic group, in sculpture, of the Last Judgment, with a part of the spire, which attains to a height not much more than two yards less than that of the Great Pyramid, which, as is well known, is the loftiest structure in the world. Such edifices, it may almost be said, are never complete. Every generation adds to them, and every generation, also, has to repair more or less of their decay. That of Barcelona, for instance, ancient though it be, has still one of its porches unfinished. That of Isaac, at Moscow, is even now swelling its proportions. That of Clermont only received its high-altar, covered with plates of beaten gold, so lately as the year 1855; that of Lausanne was quite recently repaved with asphalt; only the other day, as it were, a municipal vote was passed to facilitate the progress of the noblest cathedral in the South of France; and it yet remains a problem of nineteenth century architecture whether or not the towers of Notre Dame shall spring into pinnacles, and thus transform, as it were, the horizon of Paris. To true Parisian archæologists, this notion appears hardly less profane than the projected coating with stone of the beautiful brick towers at Alby, the modernizing of the architectural relics at Carcassonne, the paganizing of the great knocker at Durham, or tearing away its copper coverings from the Laçon cross. Transformations of the kind, as architects are well aware, are going on all over Christendom, — new friezes along the aisles of Chartres; new windows and woodwork at Evreux; a painted iron grille at Fribourg; decorations in lava-stone at Palermo; freshly designed gargoyles for the great Catholic Church of Paris, — the stones of which, for the future, are to be silicatized; and at Perpignan new walls to sustain an old roof. Amid all these cathedral patchings and restorations, however, a few stand, as we have said, signal and prominent. They are those of Cologne, Chartres, Metz, and Strasburg, with, in a lesser degree, those of Rouen, Saint-Denis, and Troyes. Yet others have no less been given up to the destroyer, — at Angoulême, at Bourges, at Cahors, at Dijon, at Laon, even the marble mosaics of Sienna. Again, in view of certain ravages said to have been wrought by rust on ironwork, various reparations have been ordered at Rouen, at Saint-Denis, at Troyes, at Saint Peter's (Rome), at Notre Dame (de Paris), and in the marble cathedral of Milan itself. The proper restoration, or rescue rather, of such edifices from both the processes of decay and the processes of the "restorer" becomes a question of the utmost magnitude. In France it is computed that there exist in our day forty-eight cathedrals, which, it is computed by M. Viollet-le-Duc, upon a calculation into which we dare not follow him, have cost, from beginning to end, 250,000,000 francs, and which are maintained in rather "a ruinous integrity," for about £40 000 a year. This £40,000, says the same authority, is totally unequal to its object. It is not a hindrance of decay, it is simply a postponement of ruin, and there is evidence to show that a similar disintregation is threatened over the entire Continent. In point of fact, there is scarcely a cathedral which has not been, in a certain degree, dismantled, and which does not require, in the same degree, to be restored. But in what "sense" are these restorations to be made? The guardians of the Notre Dame de Paris declare that they tremble when they reflect upon the probable architectural fate of Metz and Strasburg. They fancy its arches contorted, its columnar clusters deranged, its inscriptions obliterated, its monuments superseded, its chapels degraded from their original sanctity. Precisely so with the great fane of Rouen, whose glorious windows are the admiration of Europe. Fifty years ago, or rather more, a conflagration destroyed its central spire, and imperilled the existence of the entire structure. The leaden roof flowed, liquid, into the streets; it has since been replaced by a covering of zinc. The inflammable spire was superseded by one of cast-iron. It now asserts for itself, in fact, an altitude superior to that claimed by the Cathedral of Strasburg; but this, it must be remembered, includes the gilded cross, with the lightning-conductor above it, which, of course, constitute no part of the architecture or the elevation. Here again, however, is an example of the slow process by which cathedrals are restored to form and life after once having experienced a disaster. During not far from twenty years Rouen Cathedral was enveloped by a hideous mask of scaffolding; its splendid façade was literally obliterated, and its noble interior roof was spun over by spiders. The new parts of the structure when taken down were discovered to be rotten, albeit that their masonry was no more than, comparatively speaking, a few years old; while as for Chartres, perfect in proportion and venerable in point of age, it has been "restored" over and over again, and is yet demanding reparation, with its brethren of Bayeux, Menz, Vendôme, Verona, Volterra, and, as we began, Metz and Strasburg. They are gradually but surely crumbling, these beautiful and sacred dedications of times past, and half of the European architects are engaged upon plans, theoretical or practical, in order to their preservation for future times. That of Strasburg, however, may be expected to grow into completion under the steady German genius which, while adopting the French plans, patriotically insists upon their Germanic origin. Account must be made, however, for the sufferings incurred during the German bombardment, which reached a total of nearly £50,000 sterling, the roof having been almost wholly destroyed, while the walls were shattered, even among their foundations. Seven years ago the plans for this reconstruction were laid before Europe; and now, though of French design, they are adopted by the German government, so that a structure which is neither German nor French, but of universal historic value, may be redeemed in its power, as a work of beauty and art, if only the "restorers may be trusted." — *Building News.*

SLOW-BURNING CONSTRUCTION.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — In reply to C. I beg to say that in our practice gypsum is avoided as a close covering for wood on account of its impervious quality, and on iron because of its corrosive action when used by itself. It is undoubtedly a better non-conductor of heat than lime mortar, and more durable under fire, but a thick coat of good lime mortar mixed with hair, and laid on wire or dove-tailed wooden lath, meets the rule of *slow* combustion sufficiently well, and in ordinary cases may have an outer hard finish of gypsum. We do not expect to prevent fires occurring; in fact, they are absolutely unavoidable in the nature of the work done in the factories that we insure; but our exemption from heavy loss by fire is secured by assuring slow combustion and by not permitting *a concealed space to exist in the factory, where fire can be protected from water.* That is about the whole of it in respect to construction, but this would not suffice if the axiom, that "cleanliness is the absolute condition of exemption from fire," were not enforced by constant supervision under the penalty of summary exclusion from all the benefits of mutual insurance.

Observe the difference between this practice and compulsory legislation.

The Mutual Underwriters pay no regard to building acts, because the self-interest of their members is more effective than any statute can possibly be; neither do they *control* any man's business; every man is at liberty to build and operate his mill as he pleases.

We can only *advise*, and if the advice is not taken our only power is to cancel our policy. Yesterday a member asked if he might use what is called a gas machine and light his mill with the vapor of gasoline or naphtha. Our reply was, "Certainly, if you wish to do so, only on the day on which you are ready to light up please send us your policy to be cancelled, and we will return to you the unearned premium." He will not use a gas machine.

This method of advice usually suffices, because the average dividend or repayment to the assured by our combined mutual companies suffices to pay the average salary of the principal manager of every factory insured by us; gives indemnity for actual loss by fire without danger of dispute or litigation; prevents the interruption of business by serious fires, by the easy control that its methods give to its members in the management of the fires that must occur; and lastly, because the whole benefit is secured at a cost for conducting the combined companies of less than the interest upon the premiums deposited with them to meet annual losses and expenses.

In the consideration of the question of building laws and other matters, treated unprofessionally by C., the writer must follow his example, and laying aside his professional character of underwriter, he will attempt to treat the subject as a matter of grave importance in the social economy of the country.

As has been before stated, the annual cost of fires to the people of the country, direct and indirect, consists of: —

Losses, ...	$100,000,000 to $80,000,000
Cost of conducting Insurance Companies not less than	30,000,000
Cost of sustaining Fire Departments not less than	20,000,000
Total,	$130,000,000

This is the heaviest single tax now imposed on the nation for unproductive purposes, and it is, to the extent of at least two thirds, useless and avoidable if the right methods of remedy could be adopted and made general. How can this be done?

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In his function of trustee C. is obliged to disregard the rules of safety in construction and in methods of preventing fire which his judgment as architect would require him to adopt, and to avail himself of the contract of indemnity given by his policy of insurance, as a cheaper substitute. In this practice he would doubtless be sustained by common opinion. But in order that he and others may be prevented from availing themselves to the fullest extent of the opportunity that the present method of insurance would give them in building unsafe buildings if they choose to do so, C. invokes the action of the Legislature and calls for the compulsion of statutes. In this he would also, doubtless, be sustained. The writer concurs fully in both the positions taken by C. as trustee under existing circumstances, but is it absolutely necessary to set a statute to catch a statute? Must not a true remedy be found in a much more fundamental treatment of the subject?

The best building acts have not secured the safest construction.

The insurance system has only secured partial indemnity against loss by ordinary fires, and is utterly inadequate in respect to extraordinary fires.

The community pays as high a cost for inadequate indemnity as the indemnity itself amounts to to the individuals who enjoy it.

The present methods are steadily and surely tending toward disaster.

The present want of a true method of protection from loss by fire costs the community a vastly greater sum than would be required for safe construction and adequate apparatus for the prevention of fire.

We pay the bills, but we do not secure the results in either adequate safety or adequate indemnity, and C. may, perhaps, say with truth, as one of his associates lately said, that it is the American hap-hazard system that is on trial rather than the builders, architects, or underwriters; a system which we have outgrown in many directions, but not in this matter.

The official statements of the fire business of eighty-three New York insurance companies give the following results: —

Ratio of Fire Losses to Premiums.	Ratio of Expenses to Premiums.	Total.
Twelve months in 1878, 50.7 per cent.	47.1 per cent.	97.8 per ct.
Six " " 1879, 71.2 "	50.2 "	121.4 "

Insurance of any kind is but a form of contract for mutual indemnity, and the premiums are the fund to be permanently relied upon. The capital of stock companies is but a guaranty.

In the companies included in the above report the assured have contributed one half their premiums as the cost of an attempt at mutual indemnity, and the losses have absorbed twenty-one per cent more than the remainder. How long can this system last?

The present customary method of conducting the business of insurance consists mainly in employing agents to *bet* that bad methods of construction and ineffective measures for preventing fire will *not* result in loss. The odds are against this method, and erelong either it will culminate by way of another great fire, for which all the circumstances are favorable, including an inadequate supply of water in some places that we could name and where we will not take a risk at any price, or else it will culminate in the "survival of the fittest" of the insurance companies and a heavy advance in the rate of insurance.

In the mean time, unless C. is a very exceptional trustee, he may not have read the various policies on which he relies for his present indemnity. He may perhaps be surprised to find that by the terms of many of them all his decorative effects are uninsured, such as the parquetted floor, the carved staircase, the frescoed ceiling, the plate or colored glass window, the pendant gas-fixtures, etc., etc.

It is yet an open question, whether or not the State supervision of the contract of insurance and its undertaking to give a *quasi* guaranty that companies are entitled to do business because they have complied with certain rules, and because their statements accord with a certain test of solvency, which is in fact somewhat fallacious, does not really do more harm than good. It is a question whether it does not invite the establishment of badly managed companies, promote a vicious kind of competition, and whether it does not tend to give the assured a sense of security which relieves them from that personal care and supervision of their own contracts which would alone make them safe.

It is held by many that there will not be such discrimination by the assured as to whom they will insure with as will enable strong companies to require greater safety in construction, and to compensate owners for adequate measures of prevention of fire by lower rates of premium, until the State shall limit its interference to mere registration and such taxation as may be suitable to secure adequate publicity in the accounts of the insurance companies. At present few of the assured appear to pay much attention to the actual condition of the companies in which they insure, except the members of the mutual companies.

Is not the following the actual condition suggested by the strangely illogical but at the same time perfectly defensible position taken by C.? Because he can obtain an apparently adequate contract of indemnity against loss by fire from a corporation created by one statute and certified to be apparently solvent under another, it is more profitable to build or to maintain an unsafe building than it is to adopt safe methods; but this condition involves such public danger that he invokes the force of another statute to forbid him and others from taking advantage to the full extent of the opportunity which could not exist except for the statutes of insurance.

If it were necessary for C. to be as careful in regard to the solvency and credit of the underwriters as he is of the tenants, would he dare, or would it be profitable, to take any risk that could be avoided in the construction or maintenance of his building?

Insurance companies are assumed to be safe if they have met the fallacious requirement of the State, and therefore the rates of premium are fixed by the competition of the agents of the weakest companies, who take risks in which the only interest of the agent himself is his own commission on the premiums, ranging from five to twenty per cent of their amount.

Under these circumstances it is not a matter of surprise to those whose business it is to become cognizant of the facts, that the efforts of parties in interest to introduce apparatus for the prevention of fire, and other methods for additional security, are met by the tacit and sometimes active opposition of the representatives of insurance companies.

In fact, it may be said to be a question open for discussion, whether or not the present facilities for obtaining an apparently adequate and delusively cheap policy of insurance, under a quasi certificate of solvency from the State, are not in large measure the cause of the heavy annual losses by fire.

The mutual method that has been applied to the insurance of dwelling-houses and factories cannot for obvious reasons be applied to the general class of risks that are now insured in stock companies. It might be profitably extended to very many special classes, such as rolling mills, flour mills, breweries, tobacco factories, nail-works, and other branches of industry, to their great profit, and by such extension great losses might be prevented.

But the general class of risks must continue to be insured upon some plan substantially like the present one. The question therefore is, How can the present method be so improved as to make it the paramount interest of the underwriter to prevent the occurrence of fire, and to conduct the work so that it shall cease to be a bad method of betting? Whoever can solve this problem will be a great public benefactor.

Finally, in conclusion of this branch of a pleasant discussion, and before I send you some drawings of mills, by which it may be made to appear that the young men employed by the mutual underwriters can give good architectural effect to buildings in which art is subordinated absolutely to safety and utility, permit me to say that if the respondent C. be the man whom I suspect, his city warehouses, stone churches, brick school-houses, and hospital buildings might be insured in the mutual companies, so far as their method of construction is concerned, without material variation from his own plans when he is permitted to have his own way; and I still adhere to my conviction that if many architects, or many who assume to be architects, were as competent to plan and as capable of proving to owners what their true interest required as he is, there would be fewer examples of architectural effect achieved at the cost of the *most* combustible construction. I believe we can rely upon no one more fully than we can upon C. in constantly urging the necessity of adequate instruction in our schools of architecture in the art of safe building, and in absolutely subordinating all attempts at decorative effect to the necessary conditions of safety and utility in mills, works, warehouses, school-houses, hospitals, and hotels.

In respect to hotels, it may be well to observe that the number destroyed wholly or in part by fire in the United States has averaged a little over one and a quarter per day for the last two and a half years. There are several hotels that it needs only a horse-car to reach from your office, that are execrable examples of combustible construction combined with considerable architectural effect. E. A.

THE VIBRATION OF MILL BUILDINGS.

To the Editor of the American Architect:

Sir, — E. A.'s question, how to stiffen heavy wooden beams without exposing truss-rods, might, I think, be answered by some of the modes of forming built-up beams, as, for instance, in the subjoined sketch, taken from Rankine.

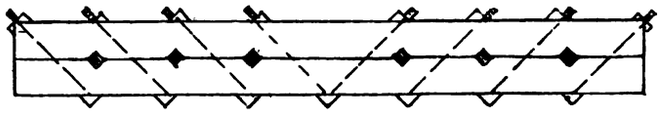

Fig. 1.

Here the bolts are buried in the wood, and thus protected from heat or from gathering lint. There is no question that in such a construction the whole strength of the wood is brought into action.

Another way of building such girders in order to avoid deflection, which, on account of the shrinking of the wood about the bolts and keys, is considerable in those constructed as in Fig. 1, would be to lay the two beams composing it one above the other, without keys, and nail boards one or one and a quarter inches thick, diagonally on each side, reversing the direction on the opposite sides. If the diagonal boards are well nailed, there will be but one neutral axis in the compound beam, the whole of the upper stick being in

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compression, and the lower one in tension, just as in a solid beam. This mode of building beams avoids the trouble of exact fitting of

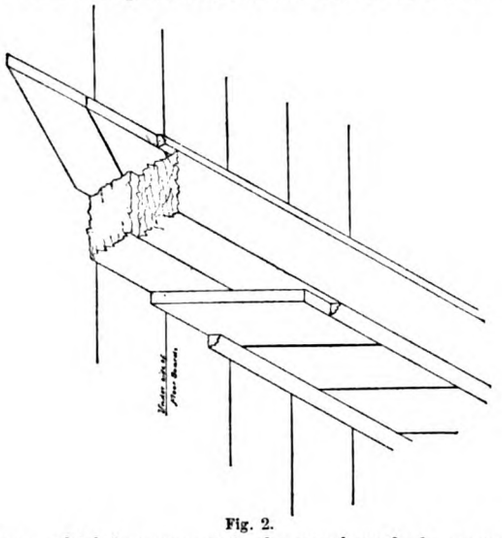

Fig. 2.

the surfaces, which is necessary in the usual methods, so as to gain friction between them. The diagonal boarding carries the strains perfectly without help from friction, and the rough sticks can be used as they come from the yard, without dressing. Moreover there will be no shrinkage endways of the board struts, and consequently no change in the stiffness of the girder. In fact the resistance to deflection is the greatest advantage in trussing a beam in this way.

Two experimental beams which I had made, and tested to breaking, not only bore between ninety and ninety-five per cent of the calculated breaking strain for a *solid* beam of the same dimensions, which is about the usual ratio with built beams, but the coefficient of deflection up to one eighth of the breaking weight was slightly *less* than that of a solid beam. This stiffness and its permanence would give such girders considerable advantage where they were required to support shafting.

For such structures as E. A. mentions two 8 by 12 inch or 9 by 12 inch sticks, laid one above the other and diagonally sheathed, would give the stiffness required. The boarding need actually extend but half the length of the beam on each side, and, by calculation, one inch would be sufficient thickness at any part, but it would look better to sheathe the whole beam, which will need no other finish, and I should use one and one fourth inch stock, to prevent curling off in case of fire. Two good coats of silicate paint would then protect the sheathing from ordinary fires, or it might be plastered. In regard to vibration I should think it might be practicable to take the strain entirely off the walls, especially if it were allowable to have posts against the piers, by combining each transverse line of posts and girders into a frame, as shown on the drawing, stiffened by *inclining* slightly the middle posts, or better, all of them. In this way any impulse transverse to the length of the building would be resisted by a part of the whole weight above the post which was inclined to meet the impulse, proportioned to the extent of the inclination, as this weight would have

Fig. 3.

to be lifted before the post could be moved laterally. The posts would have to be stronger than if placed vertically, but they have usually a surplus of strength against compression.

With very heavy machinery the resistance caused by the weights above might be increased to any extent by iron straps, as shown in the figure. With this assistance to move the top of the post toward the wall, not only the weight upon it must be lifted, but the iron straps must be broken. By cross-bracing between the frames any impulse to one would be communicated to and resisted by several others.

A combination of frames, as suggested, might be made as independent of the walls as a trestle bridge. Similar trussing could be introduced even where there were no posts against the wall, but there would be many advantages in having them, one of the greatest being that the girders, which would thus be free from the wall, would not be affected by its settlement, and shafting hung from them would retain its alignment. This independence of the wall would, moreover, allow the whole frame to be tied together without danger to the wall in case of fire, though it would be nearly as good, even if the beams were simply hooked to the posts on the under side. For stiffening mills already built heavy Ts of cast iron might be bolted to the sides of the posts and girders, which would perhaps answer a good purpose, and be out of the way of the machinery.

T. M. CLARK.

THE OLD STONE MILL AT NEWPORT.

NEWPORT, R. I., September 24, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — Permit me through the medium of your paper to explain in detail some statements made by me in an article on the "Old Stone Mill at Newport," published in the *Magazine of American History*. In your remarks, under date of September 20, attention is called to the construction of the fireplace and of the lower floor, and the question is asked, whether it is clear after all that "the niche with its queer little flues was a fireplace."

I think it was, and for the following reasons: —

In an ordinary windmill a fireplace would not be required, but in the early colonial days the Newport structure stood at some distance from the settled portion of the town, and may have been occupied by the miller and his family. Being strong and well built, the tower would prove a very rock of defence against an Indian foe, and might be called upon to stand a siege of several days; under such circumstances a fireplace would be of great advantage. Let us, however, reason simply from the construction. A fireplace built in the thickness of a wall two feet in section, whether owing its origin to the mechanics of the eleventh or seventeenth century, must have been built in the same way. The two small flues, I think, were a compromise for one flue with an area of eighty inches. Eight inches in depth is all that the rubble wall would stand, and to make the flue the whole width of the fireplace — three feet — would have destroyed all bond in the stone-work. Above the fireplace one of the "summers" entered the wall; this divided the flue, and the stone-work protecting the beam served as bond and withe.

The question of pargetting adds strong evidence in corroboration of my theory. The object of pargetting a chimney flue is to prevent the passage of chance sparks through any small interstices in the jointing of the brick or stone-work. An examination of a modern chimney flue will show that when it forms one of a stack it is only pargetted on two sides, — those nearest the wood-work, — the inner withes being left with struck joints. This is the key-note. In the "Old Mill" the north flue runs up nearly vertical and at a distance from any wood-work; this flue is not pargetted. The other flue curves off to the south and then turns up, passing directly beneath and close to the wooden "summer." This flue is fully and carefully pargetted and seems to show conclusively that whoever built it had in mind the use of fire, and the protection of a wooden floor to be placed in position at the same time.

To establish the thickness of the lower floor is more difficult. In my article I described it as coming "up to the *under-side* of the hearth, and above the crowns of the arches." Taken literally, the floor would have a depth of three feet and six inches, instead of four feet, as stated in your paper; the depth of hearth making the difference. I think it more probable, however, that the top of the floor came up just above the openings of the arches, from two feet and six inches to three feet above the abaci of the piers. All openings would naturally be closed, and with the heavy beams used by the colonists — varying in section from ten to fourteen inches — and with planking from four to six inches thick, such a depth of floor could easily be obtained. In fact, the larger the scantling the more readily could the work be accomplished, when we consider that the colonists were compelled to hew out their timber with axes, and would naturally keep the logs as near their original dimensions as was consistent with square work. Such was their custom in house-building, and it was probably the course pursued in erecting the mill. The heavy floor possessed the double advantage of being able to sustain without deflection any weight placed over its centre and also of affording protection to the occupants of the tower from the attacks of hostile savages, or even the bullets of Europeans. By this arrangement the hearth would be some distance above the floor level. If such a disposition had its disadvantages, it must have been made the best of by the occupants; unless the floor was blocked up still higher. By consulting my original sketches it will be seen that one end of the hearth rests upon an arch; and to have set it lower would have necessitated a reduction in the width of the opening.

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In connection with the above explanations, I would call attention

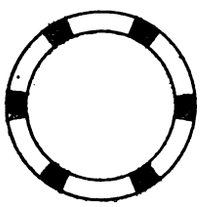

Fig. 1.

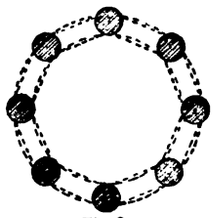

Fig. 2.

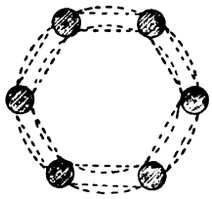

Fig 3.

to one other constructive feature; namely, the reason that may be assigned for adopting eight as the number of piers, instead of six, as at Leamington. In my published article I stated that such a disposition might have been determined upon as a perpetual record of the cardinal points of the compass. There is, however, a constructive explanation of the causes which may have led to this radical departure from the English model. By referring to Fig. 1 it will be seen that to turn true arches between piers set out on a circle, two radii are required, — a vertical one for the rise of the arches and a horizontal one for the plan. This was easily accomplished at Leamington, where every stone was carefully cut and fitted to a pattern. With the rubble masonry at Newport it would be more difficult. Here the masons discarded the horizontal radius and threw their arches straight across from pier to pier, as shown in Fig. 2. Thus the "Old Mill" is not circular at the base, but is octagonal up to the crowns of the arches, twelve feet and six inches above the ground, the circular superstructure projecting over the centres of the arches as shown by dotted lines. With six piers, as in Fig. 3, the projection would have been still more marked, and beyond the limits of safety.

In conclusion I would observe that it has not been my intention to claim absolutely for Governor Arnold the honor of having erected the tower, for that would be impossible in the light of any evidence that has come down to us. That he used it as a mill is certain, but its origin must still remain veiled in obscurity. My object is to establish the fact that, whether erected by wandering Viking or English colonist, the tower still stands, perfect in all respects and with all the features that it possessed when first erected, — the wood-work excepted, — and that no radical changes have, or could have, been made in its interior.

Geo. C. Mason, Jr.

COMMONWEALTH AVENUE, BOSTON.

Bristol, R. I., September 23, 1879.

To the Editor of the American Architect:

Sir, — Possibly some other natives of Boston, as well as myself, may wish that architects would enter their protest against the manner in which the Park Commissioners and the city authorities wish, in the extension of Commonwealth Avenue, to build a monument for the perpetual record that Boston, in the last quarter of a century, since the avenue was first projected, has gained nothing in educated tastes, nothing in wealth; and can therefore see no difference in the value to the city between an increase of its handsome features and a gross deformity of what should be one of its chief ornaments, and, on the whole, decides upon the latter on the score of economy.

More than twenty years ago the Back Bay Commissioners and the city engineer thought themselves competent to plan the street system of a new and elegant residence quarter without the aid of architectural advice. They designed a more pretentious street than any hitherto planned in this country; but they made no provision for proportionately handsome, uniform effect in the entrance corners at the commencement of the avenue, and they made no provision whatever for its effective termination. The successive authorities have followed in the footsteps of the first Commission; and have apparently despised the advice of members of your profession, though latterly a worthy gentleman of New York, more famous as a landscape gardener than as an urban architect, was taken into counsel before settling upon the last published plan of the extension, which is in some respects worse than that of 1876. It is cheering to hear that at last an effort is being made to stay the hand of bad taste which would so wantonly waste Boston's remarkable "capabilities" for developing its youthful prettiness into a beautiful maturity. Surely, sir, this subject is worthy your editorial notice, and we beg you will not deny the public the benefit of your authoritative voice in the matter.

Could not designs for the handsome utilization of the whole of the "Full Basin" be published in your influential journal? At this centenary period the Declaration of Independence ought at least to be remembered by Boston in the preparation of a suitable site for the future erection of a monument; Paul Revere, also, should have an equestrian statue. What finer site for these monuments could be had than a generous open space at the present termination of Commonwealth Avenue, perhaps flanked by crescent blocks of houses of uniform design? A branch railway from the proposed Park Station to cross the river and connect with the Grand Junction rails in Cambridgeport, and thus enable all the Northern and Eastern lines to bring their passenger trains, or some of them, into this station and also into the Providence station, would seem a wise provision in the plan. A building for industrial and horticultural exhibitions, which might be used as a winter garden, and which could be reached under cover from the park station, would also seem a desideratum. A plan showing these embellishments and conveniences would be appreciated by the public, and would surely be worth any architect's labor in preparing. But the proper authorities should certainly offer premiums for competitive designs for all this, and these designs should be placed on exhibition where they could be seen by the public side by side with the present plan. In making these suggestions I have no axes to grind. I am not an architect, and have not the skill necessary to prepare such a plan as my imagination pictures, and which I hope an artist may design.

Your obedient servant,
Blaxton.

NOTES AND CLIPPINGS.

New York Pavements. — The New York Commissioner on paving sets his face against cobble, wood, and concrete materials as inefficient. He complains of the frequency with which the streets are torn up and imperfectly repaired by plumbers, gas companies, and others, in following their individual callings. To overcome these damages, he has prepared an ordinance requiring a fee on each permit for making an excavation, to cover the cost of replacing the pavement, the work to be done by skilled workmen, under the charge of the superintendent of public works.

Fall of an Oil Mill. — On the 25th the oil mill and elevator of I. P. Evans & Co., at Indianapolis, was partially demolished. The weight of 30,000 bushels of flax-seed, stored on the second and third floors, forced out the walls on the north and west, damaging the entire building to such an extent that it will have to be rebuilt. The night force had just been relieved and the day force had not gone on duty. If it had happened a few minutes later a number of men would have been buried in the ruins. No architect was employed in building the mill.

The St. Gothard Tunnel is being pushed rapidly to completion. Four thousand men are now engaged in the work, and fresh hands are taken on every day. The advance is at the rate of nearly eight metres a day, and the length still to be bored is 1000 metres, so that the tunnel will probably be finished by the end of this year or the beginning of next. The making of the Mont Cenis branch will be commenced on the first of October, and its completion is expected to coincide with that of the main line.

Th. Valerio. — The death is announced by cable, in his sixtieth year, of Théodore Valério, a French painter and etcher, who made himself an excellent reputation abroad by his paintings of scenes from the picturesque life of the Montenegrins and Hungarians, by his later landscapes of Morbihan, Brittany, and his numerous etchings.

George Cruikshank's autobiography was ready for publication at the time of his death on February 1, 1878, but has been delayed from various causes. It is believed now that an early issue of it will be brought about.

Brickwork. — Though architects' specifications usually introduce the clause that the "bricks used are to be hard, square, sound, and well burnt," it is well known that builders avail themselves of a little latitude in the interpretation of this clause. The truth is, that the estimate of a brick should be formed upon the suitability of it for its purpose, and therefore the only true method of judging of bricks is to know where they are to be placed in the building. The right brick in the right place, to slightly alter a common aphorism, should be the only crucial test. Every builder knows that the bricks he would use externally are not so well suited for interior plastered walls as those of rough and misshapen manufacture, which give a better "key" to the plaster, and which, from their being less burnt, are lighter, and more adapted for interior purposes. We may here say that only facing-bricks require to be "sound, square, and well burnt;" and for the sake of being consistent, as well as being correct, a specification ought to have such a clause as the following: "The bricks to be adapted for the purposes for which they are intended; the facings to be of selected, square make, hard, and well burnt bricks, of uniform color, and the other bricks to be of sound and well burnt quality." For paving, copings, and other portions of buildings subject to weight and wear, a hard variety of brick is necessary, and a requirement of this kind should be inserted in the specification of all new works. We may here refer to three varieties of bricks: 1. Ordinary bricks used for walls; 2. Cutters or rubbers, used for arches and other purposes, where the bricks require to be cut to some particular shape; and 3, Underburnt bricks, suitable only for inside walls. The requirements of ordinary bricks we have already discussed; "cutters or rubbers" should be made from a mild earth, freed from lumps of all kinds, so that it may be rubbed to a smooth face and leave fine arrises. For exposed outside work, it is better to use moulded bricks, as they are better burnt. A good rubber should be of uniform texture, and not easily cut by a knife — conditions, however, they do not always fulfil. In "Notes on Building Construction," there are a few useful remarks made upon the method of distinguishing between "clamp," kiln, and machine-made bricks, which we may quote for the good of our younger readers. "In clamp-burnt bricks the traces of the breeze mixed with the clay can generally be seen. Kiln-burnt bricks often have light and dark stripes upon their sides, caused by their being arranged, while burning, with intervals between them. . . . . The best kiln bricks are of a uniform color. Machine-made bricks may easily be distinguished — if wire-cut, by the marks of the wires, if moulded, by the peculiar form of the mould, letters on the surface, etc. In distinguishing good from inferior kinds of brick, one point is to notice if they are free from cracks and lumps of lime, which, by slaking with moisture, split the bricks." Another, but secondary point, is the shape and uniformity of size; the edges should be fine, sharp, and square. The quantity of water a brick will absorb is another excellent test of its quality. The percentage of water absorbed varies. In hard paviors the percentage is nine and a half, in machine-made red it is about ten, but the average absorption is about one sixth of the weight, and in highly vitrified about one fifteenth. — *Building News.*

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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WE are glad to believe that Lord Dufferin's scheme for the use of Niagara Falls is more likely to be carried out than Dr. Siemens's or Sir William Thompson's. The joint commission of the State of New York and the Dominion of Canada met on the ground not long ago to discuss the proposition to which we have before referred (*American Architect*, July 5, 1879), for securing the lands about the falls to be maintained by the two governments as a perpetual park, free from private encroachment. The commissioners had apparently no difficulty in deciding that the grounds needed the care of the governments to protect the scenery from disfigurement or destruction; and find themselves substantially agreed, we understand, as to the manner in which the thing should be done. It is expected that they will meet again in November, and render a decisive report, with a scheme for carrying out the project. This action comes none too soon. The degradation of the surroundings warrants the New York *Times* in saying that already "the superb adjuncts of the fall scenery, on both the American and Canadian sides of the chasm, have been robbed of much of their original beauty and grandeur. Where picturesque groves once stood, unsightly mill-sheds and rickety drinking booths now appear. On the Canadian side, only a few stunted trees remain to remind the visitor of the old-time forests. Year after year the change goes on, the rocks are covered with the signs of quack medicine men, every prominent outlook is crowned with the booth of some vagabond peddler, and the grand old trees, once the pride of the neighborhood, are being cut down to build mill-races or supply with fuel some petty factory." The vexatious exactions of people in possession of the approaches to the falls have done as much as anything to win the public mind to the idea of protection; but a still more serious argument is the need of securing the falls against the ravages of speculators, who would ruin them for the sake of mechanical uses, or of savants who itch to convert them to some scientific toy.

THE building accident of last week was one of peculiar horror. On the last day of the county fair at Adrian, Mich., a thousand persons or more had gathered on a new grand stand at the fair-ground to watch the closing races, when the stand suddenly gave way, falling partly into the river, on whose brink it stood, and partly upon the track. More than two hundred persons were reported sufficiently injured to be under medical treatment; sixteen had died within a day or two of the accident, and others were expected to follow them. The cause of the fall was of course the bad construction of the stand. It was a slight building, forty-four feet by one hundred, with a lower story intended to serve as a restaurant, but used for a part of the exhibition and filled with people at the time of the accident. It had just been put up under contract from plans and specifications by Mr. C. F. Siser. There is a disposition to blame the designer, and it is clear that the blame must be with either him or the builder for the slightness of the structure, which was very lightly framed, it is said, and simply spiked together, without framing or bracing. In fact, the western system of "balloon framing" appears to have been very logically carried out. The architect on his part is said to claim that his directions were not followed, and that he did not consider the work finished. We are not told, however, that he entered any protest or objection against using the stand as it was. There can hardly be any difficulty in fixing the responsibility for this terrible disaster, if the people of Adrian are bent upon fixing it; and we may hope that those to whom it may be found to belong will not get off with a newspaper scolding. It is not pleasant to think that such an accident is likely to occur at any time in any part of the country, and that no defence is provided to protect the public against the ignorance that causes it.

THERE is some encouragement for the inmates of unsafe tenement-houses, and, what is perhaps more likely to be on the whole efficacious, some salutary warning to their proprietors, in the late decision of the Court of Appeals of New York. Mr. Patrick Mullady was owner of a tenement-house in Brooklyn which burned two years ago, and the staircase burning first, as usual, the wife and child of Joseph Lilly, one of the tenants, were burned for lack of means of escape. Mr. Lilly sued for damages on the ground that the house was not provided with a fire-escape, as is required by law. The jury returned a verdict of some sixteen hundred dollars damages. The case was twice appealed, and decided by each successive court in the same way, so that the decision would seem to be sufficiently well established to serve as a warning. So long as fire-escapes are set forth by the law as the protection due to the occupants of the class of buildings known as fire-traps, their employment ought to be assured, not only by liability of damages to those who suffer through the omission of them, but also by sure penalties enforced by the State for the general welfare against those who neglect to provide them. It ought, in fact, to be made more expensive to neglect them than to provide them, apart from the liability of compensation to the injured.

PER *contra* we have the rather cynical report by Judge Fallon, of the South Boston Municipal Court, of the inquest held on one of the persons who were burned in the tenement-house fire in South Boston, which we described a week or two ago. The report says that "though there was no fire-escape, the building was deemed as safe as most other cheap tenement-houses." It goes on to explain how one and another of the inmates might probably have succeeded in escaping, nevertheless, if he had had judgment enough to do the best thing, and ends by saying: "I think it can be truly said that the great loss of life was in a measure, if not wholly, due to the want of presence of mind of the unfortunate inmates." All this is probable enough, and so far as it is probable is sufficiently obvious, but it strikes us as altogether trivial and beside the mark. It is quite true that the Gold Street tenement-house was as safe as most others of its class. Here is the important lesson of the disaster, and the reason for making a strenuous effort for the improvement of the whole class, — for making, if there is legal warrant, a deterrent example of this case. If a fire-escape is the utmost means of security which the sense of the community is yet ready to impose, let us at least insist on it rigorously. The influence of the verdict, so far as it has an influence, will be to encourage the owners of perilous buildings in their neglect of precautions, and the public to believe that after all things are very well as they are, and that if women and children will only show activity and presence of mind in getting out of windows and off of roofs we need not look out for their safety. The public is only too lethargic in providing for the general safety, and to lull them into a feeling of security is to misuse the one opportunity for good which is to be evoked from this calamity. Although it is possible that dexterity and presence of mind and an unerring judgment might have extricated some or even all of the victims of this fire, we all know that most people, if suddenly waked to an overwhelming peril, lose their presence of mind, and act by instinct, not by judgment. We know that if we are planning a theatre with an eye to the danger of fire, we must give the audience an opportunity to escape not only with considerate discipline, but in the height of disorder and terror. It is the ordinary condition of mankind not to have presence of mind in the face of sudden and extraordinary danger; and it is to the ordinary condition of mankind that human laws and human precautions must be adjusted.

WE have received a file of newspapers from Detroit, containing an animated controversy which shows that there is some disagreement over the proposal to build a new market there; and

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that the procuring of plans for the new building was done under circumstances the like of which are familiar to us all, with the usual result of recrimination, accusations of bad faith, and an attempt to set aside the decision. We have not traced the history of this controversy from the beginning, but it appears that some time ago an order passed the common council for building a new market house at a cost of fifty thousand dollars, and a committee was appointed to select plans. A competition was accordingly invited, and a premium of three hundred dollars offered, not for sketches, as we understand it, but for the successful plans. This invitation was not of a kind to allure the more experienced and better occupied architects, but secured a certain number of plans; and a design was accepted from one of the younger men which was rather ambitious, being adorned with towers, and in order to fill out the author's architectural conception providing extra room which, it was suggested, should be used for an armory or such other public use as it might suit. The plans having been accepted, however, newspaper critics have attacked them, whom one or two architects have seconded vigorously, Mr. Charles H. Marsh, an unsuccessful competitor, having opened fire, both in a newspaper article and by an open letter to the common council which condemns the accepted plan and invites a new trial. He is assisted by Mr. Gordon W. Lloyd, an architect who refused to compete: — to all of which Mr. F. G. Russell, alderman, and apparently the architect of the successful design, has retorted in letters fuller of wrath and vilipending than of argument.

All this makes a very pretty quarrel, but its interest is entirely local, and we shall not attempt to follow it into detail The suggestions of the critics that it is better to build a market alone, and finish it, than to begin upon a building for compound uses; that towers are superfluous to a market; that a basement room forty-five by sixty, and nine feet high, lighted only from the side, is not quite the thing even for a fish-market; and that iron and glass are better than close walls and sparse windows, certainly seem in accordance with the eternal fitness of things. It would be safe to advise the authorities of Detroit, if they are in a mood for advice, that according to the experience of most cities, markets are better for being buildings that are used for nothing else, for being detached on all sides, or as nearly so as possible, and for being open to the roof; that they need as much air and light and as free application of water as possible. To these pretty well acknowledged conditions one might add that their construction had better be light, and their architecture is most satisfactory when not too pretentious; that they are not the kind of buildings most people would choose to grace a grand thoroughfare, but are best placed where their natural accompaniments of noisy traffic and odors will not obtrude themselves upon the public, nor their own use be encumbered with the dust and throng of a great business street. As for the competition, with its award of three hundred dollars for plans of a building to cost fifty thousand, it is not surprising if architects held aloof from it. One only wonders at those who keep such competitions alive by contributing to them. The common attitude of their authors is sufficiently well indicated by Alderman Russell's remark that it was "believed that three hundred dollars would bring in a suitable plan." This is the belief on which committees are wont to act, and as things go it is not strange. Three hundred dollars will always bring a plan, and to the inexpert committee one plan is apt to be satisfactory till another is seen.

The passion of the modern Italians for unifying their ancient and their present history, and their delight in furbishing up old traditions for modern use, has found a new and characteristic outlet. The cheerful assurance with which they revamp their venerable buildings, the happy-go-lucky content with which they repaint the pictures of their great masters when age has dimmed them, are familiar, — as familiar as the disregard with which they pass by, or sweep away, the remains of old art which do not invite, or will not submit to, the attentions of the modern besom. Nobody, so far as we know, has yet proposed to restore Pompeii, and adapt it for modern uses, but some one has now devised a way of passing the current of modern life through that too, and connecting it with the observances of to-day by celebrating the eighteen hundredth anniversary of its destruction. The anniversary occurred on the twenty-fifth of last month, and invitations were sent the chief archæological and other artistic societies of Europe to attend the ceremonies, which consisted of a report from the Director of Excavations, a view of the principal monuments, and a special excavation of some hitherto unvisited parts of the ruins. This last was naturally the most attractive feature of the celebration, as it was the unique one, and the apparently unmanageable number of forty new diggings were appointed for the great day, all excavation having been interrupted during the preceding summer months. A savor at once local and classic was given the ceremony by sending the invitations on classic tesseræ inscribed in red mural characters, thus: "Tessera for gratuitous admission to Pompeii. — The XXV of September, MDCCCL-XXIX, on the recurrence of the XVIII centenary after its destruction." This recalls the passage in a favorite German students' song, explaining how, in the Syrian hostelry at Ascalon, the waiter

> "Brought in the bill in cuneiform
> Indented on ten tiles."

M. VIOLLET-LE-DUC.

The place that Mr. Ruskin might have occupied, if he had been a Frenchman and an architect, with a turn for science, Viollet-le-Duc has filled. It is not his fault if his books are frequently used as mere storehouses of forms, to be employed without discrimination. No one would rebuke such abuse of his labors more severely than himself. That which forced itself upon his own mind in studying Gothic as well as ancient architecture, but especially Gothic was the profound technical skill of the early builders, their knowledge of all matters of practice affecting their profession, and their ingenuity in providing for every contingency with the means, often scanty, which they had at hand; and it is this which he seeks principally to enforce. The labors of Ruskin in bringing to our attention the inspiration and feeling with which the mediævals worked are well supplemented by the detailed and minute view which these books give us of their processes.

Few realize the vast change which has taken place in the estimation put upon mediæval design since the time of Wren, who, speaking of the architecture called Gothic, which even in 1835 Nicholson considers "a term of reproach," refers to it as consisting in "mountains of stone, not worthy the name of architecture."

After a few other archæologists and sentimentalists had for a time pointed out and defended the beauties of the buildings of the Middle Ages, but without pretending to understand their construction, came Pugin and Ruskin, who were perhaps the first to perceive how essential was the element of truth in an architecture which their predecessors had thought could be reproduced in lath and plaster.

The fervency with which Ruskin preached the new doctrine of moral principle in design aroused the sympathy of those who saw in it a means of at last freeing art from its wearisome slavery to stock patterns, of which even Pugin and Rickman only professed to have discovered a new set, and some of the best minds in Europe set themselves to the revivification of truth in design with a devotion and enthusiasm which have not yet faded away. But they would have lost much, from sheer impossibility of any one man, or set of men, inventing an architecture in the hum of professional life, if not *de novo*, at least with the scanty materials then accessible, if Viollet-le-Duc's books had not opportunely appeared, overflowing with suggestions, examples, and precepts, which were eagerly seized upon and appropriated.

Perhaps the deep impression produced by the knowledge of the constructive skill, the ingenuity and versatility of the French mediæval school, derived from these books, overpowered for a time the natural independence of precedent which the following of their own principles would give, and led to that frequent adoption of French models by English architects of avowedly Gothic proclivities which has been wrongly attributed to mere desire for novelty; and yet, great as is the influence which that school has exercised of late, we are far from an adequate acknowledgment of the surpassing skill of those who originally created it, or of the comparative clumsiness and inefficiency of our modern constructions. It is instructive to reflect upon the paucity of means with which the mediævals attained results which all are boasted learning and wealth cannot always rival. There our not many architects who, with all the help that their science can give, would undertake to reproduce the cathedrals ot Amiens or Salisbury, and yet the poor *maîtres de l'œuvre* of the thirteenth century knew how to construct them, without cement, without

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iron, except in small pieces, and little of that, without large stones for bonding, because they had no means of hoisting such materials, and could arrange the masonry with certainty, so that its own weight should hold it together for seven hundred years. How many architects could build the front of Notre Dame with its flanking towers in *lime mortar*, and be sure of its settling uniformly? Or how many engineers would dare to oppose the thrust of a vault by a buttress overbalanced toward it, both the buttress and the vault being of small stones without any such cohesion as would be given in one day by cement? Or where do we now find such refinements of construction as the beautiful piers of Salisbury, built in low courses, with wide joints of soft mortar, but stiffened against bending by their four slender marble colonnettes, in long pieces, each joint encircled by a slender bronze ring, secured to the body of the pier by a long appendage in the form of an anchor, built in between the stones? It is amusing to observe the confidence of mankind in the novelty and value of modern inventions. To this confidence we owe the satisfaction among other things of paying a royalty on the well-known expanding water conductors, square or corrugated in section, which were used in England in the fourteenth century with the same object, — to prevent bursting by the freezing of water in them, — and remain in some places to this day, as we might have known if we had only thought of looking for them, while the better class of manufacturers are in many instances trying hard to bring their products up to the standard of the once-despised mediævals. The progress is slow, but it will be sure; the principles of truth in design, and reason in construction, notwithstanding occasional reactions, will not be abandoned by those who have seriously adopted them.

To all such, the works of Viollet-le-Duc will long remain one of their greatest comforts and resources; a resource, not in the sense of a means for stupid copying, but as showing by example the way in which the characteristic properties of materials can be availed of for suggesting forms continually fresh and interesting; and a comfort, by the proofs which they give, that some, at least, of the greatest masters of architecture that the world has seen found it no hardship to live and die in obscurity, content with the consciousness of duty well performed, and finding sufficient amusement for their modest leisure in the study of the little field plants, whose delicate forms they reproduced upon the stones of their buildings with such matchless grace and tenderness.

Viollet-le-Duc, though first of all a scientific and practical constructor, was not the less an artist. He won repeated medals for his water-color sketches, and if we are not mistaken his reputation as a designer preceded his fame as an archæologist and architect. There is a certain work, published about 1840, consisting of pictorial and historical sketches of the ancient provinces of France, which seems never to have been completed, but volumes relating to one or two of the provinces are occasionally seen; one of them being exhibited in the British Museum, where it is labelled as the finest existing specimen of modern book-making. The portion entitled "Souvenir de l'Ancienne Picardie," in three magnificent volumes, contains lithographic illustrations by many hands, among which are Samuel Prout and Viollet-le-Duc. The latter's drawings are finished works in black and white, drawn with a fire worthy of Alfred de Neuville, whose works they somewhat resemble in treatment and choice of subject. Generally they represent a procession, battle, or other memorable circumstance in the history of the particular château or church under consideration, and the drawing of the accessories is as careful as that of the figures themselves.

In the drawings of later times, of course the buildings are principal, and the figures accessory; but we have sometimes wished, in looking at the vigorous little scenes of war which explain the diagrams of redoubts and *têtes de pont* in the Dictionnaire, that for once the artist might forget the architect. The constant subjection of pictorial effect to clearness of outline, and the habit of associating all other forms with architectural lines, were undoubtedly the source of the pronounced mannerism which is shown wherever his drawings of any subject can be compared with those of others, but this did not interfere with their substantial accuracy, nor did it, as it would in most men, obscure his perception of the peculiar grace of modelling and outline which form the essence of thirteenth century sculpture. In the representation of this, so far as it can be represented on paper, Viollet-le-Duc, to our mind, has never had an equal.

The writings of Viollet-le-Duc, to an attentive reader, show him to have been endowed with a temper serious, almost melancholy, interested in many things which do not often engage the attention of a busy architect; intolerant of what he conceived to be commonplace or unreasonable, but kind and patient with those whom he hoped to instruct. A quotation which we have often called to mind in visiting the great apartment-houses now so popular will serve to illustrate the seriousness with which he regarded professional subjects, and will perhaps surprise some readers, as the utterance of a Parisian architect.

Speaking of the "Magasins de Famille," as he calls these structures, he says, "In our opinion, a state cannot be called morally civilized until the day when each citizen shall possess his own home, in which he can bring up his family, where he will leave the souvenir of the good which he has been able to accomplish, or of the services which he has rendered to his neighbors. Walls have ears, and the man who would do an unworthy action in the hired apartment which he may quit in six months will hesitate to give himself up to his evil inclinations within the house which is his own and which his children will inhabit after him." (*Dict. Rais.* Art. MAISON).

And in another place, after describing the beautiful decorations of the mediæval chancels (Art. AUTEL), he says, "Is it not truly the noblest mode of honoring God, to place art above all other things in his sanctuary? And was there not a true and just sentiment in the perfection which the artist strove to give to his humble materials? We confess that we are far more touched at the sight of an altar of common stone on which man has exhausted all the resources of his art, than before those clumsily shaped masses of bronze or silver, whose value consists in their weight, and which excite cupidity far more than they touch the heart."

His life was indeed more that of a teacher than an original creator, and we may be glad that it was so, for in the present state of art he would have been of less use in any other capacity. As it was, he found the world none too well prepared for him. Little by little his fame spread among thinking people, and those who were really incapable of seeing his merit found it best to keep silent. The misfortunes of the late Emperor, who was well qualified to appreciate him, doubtless delayed to some extent the growth of his reputation, but although he had no business office, and was principally devoted to his writings, he had of late become an authority in the adornment of Paris, and a member of the municipal council, and to him is due the project for the adornment of the Avenue des Champs Élysées with statues which has lately been adopted.

HYGIENE AND PUBLIC HEALTH.[1]

WE confess ourselves to be rather unfavorably disposed towards cyclopædias in general. Whether it be that the articles which compose them are apt to be hurriedly written, and often by persons whose knowledge of literary work makes them more available than others more distinguished for their learning on the given subject, or that the various opinions of the different authors upon topics which must necessarily overlap, to some extent, occasion confusion in the mind of the reader who finds them presented side by side, may be a question, but our experience has generally been that a student, especially of technical subjects, could, if properly directed to original sources of information, gather for himself what he needed from these with less expenditure of time and trouble than from the ostensibly condensed but really diffuse *résumés* which purport to be made for his special convenience.

There are two ways in which such books may be constructed, one by entrusting some individual with the task of collecting and digesting all the knowledge attainable upon all the subjects within the scope of the proposed work, so as to present it elaborated, so to speak, in a coherent form, ready to be assimilated by all the minds to which it is offered; and the other by collecting a series of independent theses, each by a master of his particular topic, but without any attempt at unity either of thought or of style. The first method, in skilful hands, is generally the best. Repetition is avoided, and the information given, although the expert may sometimes accuse it of lack of freshness or completeness, is presented in such a form that the average reader is enabled to gain a clear understanding of the rudiments, at least, of each branch, and more than this it is hardly worth while to attempt.

The second method is apt to result in a series of memoirs, each of which is interesting to a comparatively small number of specialists, but unintelligible to the mass of readers, while the same ground is sure to be covered two or three times over in different ways, resulting at the best in waste of the student's time.

The publishers of "Hygiene and Public Health" have thought, reasonably enough, that in view of the great spread of interest in sanitary matters, and the progress of knowledge of organic chemistry, the rationale of healthy life and the causation of disease, with

[1] *A Treatise on Hygiene and Public Health.* Edited by Albert H. Buck, M. D. Vols. I. and II. New York: William Wood & Co. 1879.

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the increase in the number of appliances and methods for protection against deleterious influences, an unprejudiced *résumé* of the latest facts and opinions regarding that group of subjects related partly to medicine, partly to physics, which are included under the general name of hygiene, would be of use to the large number of physicians, town and city officers, engineers, architects, and householders, on whom may be imposed the duty of guarding against or remedying the evils which flow from ignorance or neglect of nature's laws. They have attempted to supply the deficiency by the method of collecting essays, most of them by good hands, on the hygiene of infants, of soldiers, miners, and other persons, on water-supply and drainage, hospital construction and vital statistics, with many other allied matters, but that the attempt is wholly successful we cannot conscientiously assert. As a manual the work is too cumbrous and too technical to be of great use to many of the readers who most need such assistance, and at the same time, while many of the judiciously selected subjects are treated in a manner which leaves nothing to be desired but a little less technicality, others are disposed of in a manner which, if not absolutely careless, does not show the precision or knowledge which should be required of writers on such topics.

Notwithstanding these defects, of which we shall have occasion to point out particular instances, the two volumes form a work of great value. If not all that it might be, it is by far the best general view of the subject with which we are acquainted, and there are few who will not find profit in reading it, and keeping it at hand for reference, while the best informed will meet with new and interesting matter in many of the articles.

Dr. John S. Billings opens the book with an introductory chapter, judicious and forcible, as might be expected of him, on sanitary legislation and the duties of health officers. Discussing the modes in which boards of health are appointed, and the manner in which they execute their trust, he makes one suggestion which may well be taken to heart by all who have to do with the election or appointment of such officials, that a lawyer, an engineer, and a physician, each fairly skilled in his profession, associated as a sanitary board, are by no means equivalent to one man who has had so much training in each of these professions as to be well acquainted with that part of each which has a bearing on hygiene. When the public, especially in this country, shall have learned the value of special knowledge, and understand that a man who has devoted his life to a special subject is likely to know more about it, and to be more useful and efficient in that particular branch, than others, however intelligent, whose qualifications consist chiefly in self-confidence, an important advance in civilization will have been made.

He quotes from Mr. Dorman B. Eaton's work on sanitary legislation the account of the constitution of the New York Health Board at one time, when "out of the forty-eight health wardens and assistants more than half were keepers of corner groggeries, and the other half were partisan repeaters and bullies," so that the mayors for a whole term did not dare to call them together, and "the exercise of their authority became a greater peril than miasma or contagion."

In contrast with such officials the memory of the late Massachusetts State Board of Health shines with peculiar brightness, and few New Englanders will fail to experience a certain pride in observing the frequency with which the labors of that board are referred to and their reports quoted in this, as well as most modern sanitary works.

As an aid to sanitary practice, Dr. Billings considers it essential to understand clearly the present condition of scientific knowledge regarding the nature of infection. As he says, "great as is the importance of filth as a cause of disease, it is necessary not to overestimate it, and to beware of the popular notion that filth is almost the only thing which requires the attention of the sanitarian." He shows that exclusive attention to the removal of the products of animal and vegetable decomposition not only cannot prevent such diseases as scarlatina or measles, but may under some circumstances be of no avail against the typhoid infection, and quotes from Dr. Netter Radcliffe that "the fundamental principle of sanitary practice is the discrimination of conditions under which disease prevails," and that "to relegate sanitary matters to common notions of cleanliness, and to 'common-sense,' is to relegate them to general ignorance and general slovenliness."

He therefore gives a synopsis, extremely interesting, but too long to quote, of the present condition of knowledge regarding infectious diseases. In brief, the weight of evidence, in his opinion, goes to prove that certain microscopic forms of life, originating or capable of existing outside of the body, although harmless under ordinary circumstances, may, under others, become either the producers or carriers of a deadly poison. He describes the diseases in which such organisms are positively known to play a part, the "malignant pustule" of cattle, the hog-plague, and relapsing fever, and compares them with diphtheria, in which the presence of similar microphytes is probable, though not established, and with scarlatina, small-pox, and measles, the contagious principle of which is thought to consist of certain minute transparent particles found in the blood, but concerning which there is no *evidence* that they can, like the bacteroid forms, reproduce themselves outside the living body. A singular and suggestive observation is mentioned in regard to one of the last-described diseases, — small pox. As is well-known, the "specific contagium" fevers, in which are included small-pox and its milder form, the vaccine disease, usually affect the same person but once, and in the case of the vaccine fever it has been found that this immunity is connected in some way with the presence of the vaccine cicatrix, since in cases where the limb containing the cicatrix has been removed the person has again become susceptible. It is a common notion that vaccination is a certain protection against small-pox only so long as the scar left by it remains visible, and it would therefore seem that this idea may have some reasonable foundation.

Concerning the specific poison of the disease known as pyæmia, septicæmia, or hospitalism, Dr. Billings considers it "highly probable" that the action of microphytes is necessary to the production of the septic poison; and that this is the received opinion is shown by the precautions usually taken in hospitals to protect the living tissues, during and after surgical operations, from any possible contact with the germs which may be floating in the air. Some protect the part by impervious coverings, others, with the same object, give it the freest possible exposure, that noxious atoms may escape. Sometimes a serious operation is performed with the limb wholly immersed in an atmosphere of carbolic acid vapor.

What the action of the infusoria may be is far from being explained. Some organisms which are known to have the power of causing putrefaction under favorable circumstances exist constantly in the healthy body without harm. It seems to the author necessary, in order that the microphyte or microdeme, as he prefers to call it, may become the starting point of the septic process in the living organism, that it shall have been derived from, or come in contact with, some specific source of contagion, or else that the condition of some part of the living body shall have been so far changed from its normal vitality that the microdeme can flourish in it as in dead organic matter. In connection with this he quotes the observation of Dr. Burdon Sanderson, that while the ordinary bacteroid forms have not, at least to a marked degree, the property of producing the septic poison, it may easily be developed in great potency by injecting fluids containing these forms into the peritoneal cavity of a guinea-pig, reinjecting the effused fluids thus formed into a second animal, and so on, each successive production of fluid increasing in its power of producing rapid pyæmic infection.

After a slight reference to the sanitary protection associations at Edinburgh, and Newport, R. I., this admirable paper closes with a list of two hundred and five titles of books on hygiene and state medicine, selected, the author tells us, out of a much larger number, but certainly tolerably exhaustive, comprising, as it does, works in eleven languages, including Magyar and Polish.

Next comes a treatise on infant hygiene, by Dr. Abraham Jacobi, of New York, which we will not undertake to criticise, as it is avowedly intended for the medical profession. It is, however, not too technical for the comprehension of most intelligent persons, and those who have, directly or indirectly, to care for the health of very young children will find much to read and remember.

Some of the advice contradicts prevalent notions, but is probably none the less valuable on that account. For instance, the doctor discards the very prevalent theory that it is essential to a baby's health to feed it with milk from only one special cow. He says, on the contrary, that he prefers to rely on the mixed milk from a dairy on account of the possibility of changes in the health of any one cow.

A mixed nourishment for infants is spoken of with commendation which, we venture to say, would hardly have occurred to a layman, consisting of one pint of water to one quart cow's milk, and a half teaspoonful of officinal dilute muriatic acid. He gives good reasons for his high opinion of this compound, and muriatic acid may be remembered as one of the things which is good for nursing babes. Another practical suggestion is that cow's milk should never be administered to young children without the addition of salt, and the doctor moreover says that under all circumstances he forbids that infants shall be fed on raw, that is, unboiled milk. Some directions about children's teeth, and the proper school age, carry to their eighth year the subjects of a paper which we finish with sincere regret that it could not have been extended to cover a much larger portion of childish life.

Next follows a rather over-scientific disquisition on food and drink, by Dr. James Tyson. The portion which will most interest sanitarians is that describing the development and mode of communication of trichinæ and tænia.

The experienced health officer will readily see how this knowledge can be applied in preventing the spread of these disgusting and dangerous parasites, whose existence is continually fostered by the filthy practices common in our rural districts. Individuals who have only their health to guard need to read but once the natural history of *tænia solium*, which can be found in any encyclopædia or book on zoölogy, to be effectually warned against eating raw pork, or corned beef, however good its condition may seem, or any meat whatever, whether cooked or not, in which are seen "vesicles, white spots, or streaks of an uncertain nature."

A tract on "Drinking-Water and Public Water-Supplies" is furnished by Professor William Ripley Nichols. This contains a number of valuable reference tables, with which, indeed, the whole book is well furnished, but there is no unnecessary display of science. If we were disposed to suggest improvements, they would be in the direction of omission of some of the matter drawn from English text-

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American Architect and Building News Oct. 11, 1879.

No. 198.

The Heliotype Printing Co. 220 Devonshire St. Boston

DESIGN FOR UNION LEAGUE CLUB-HOUSE.

James Renwick Architect

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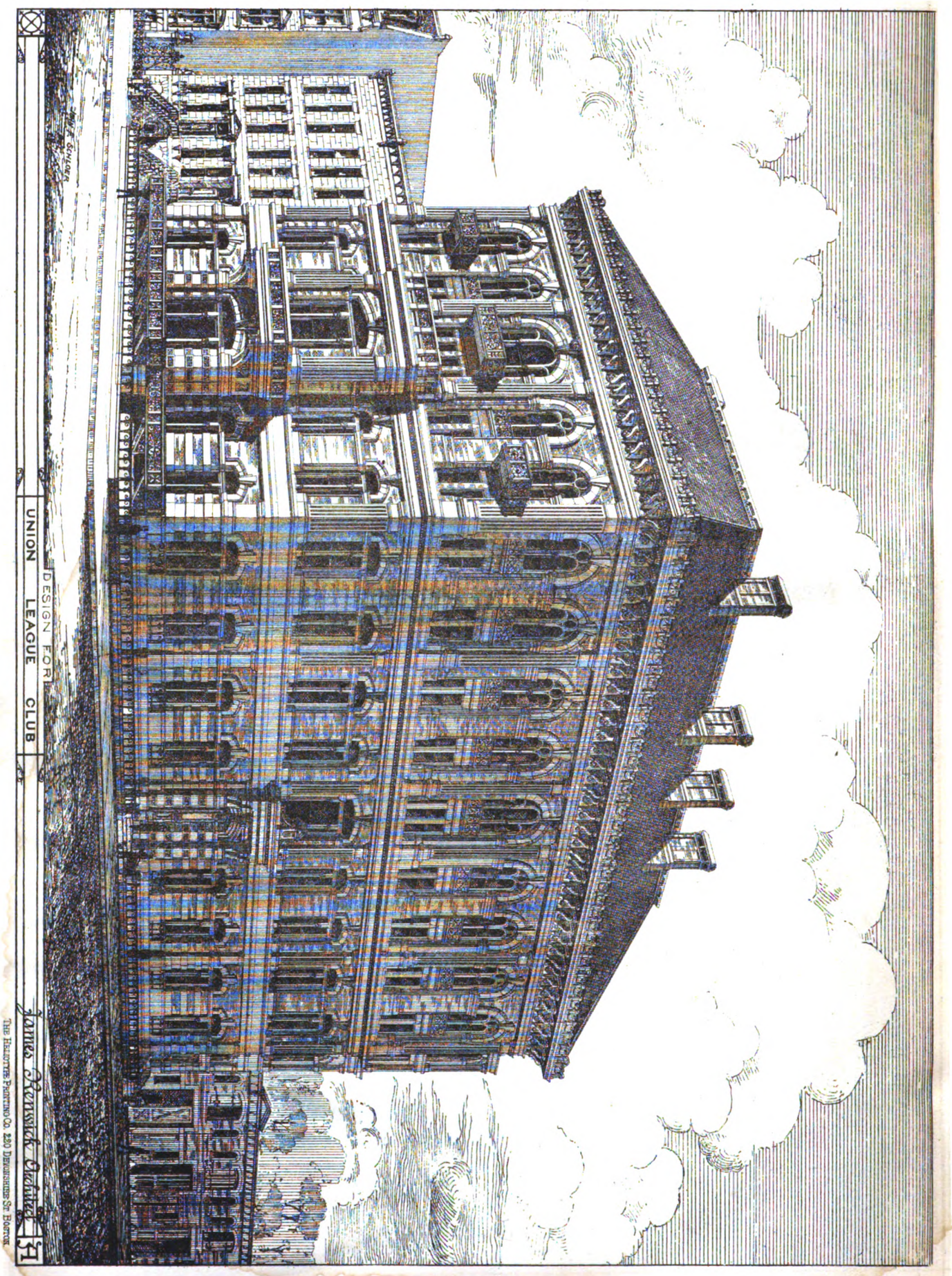

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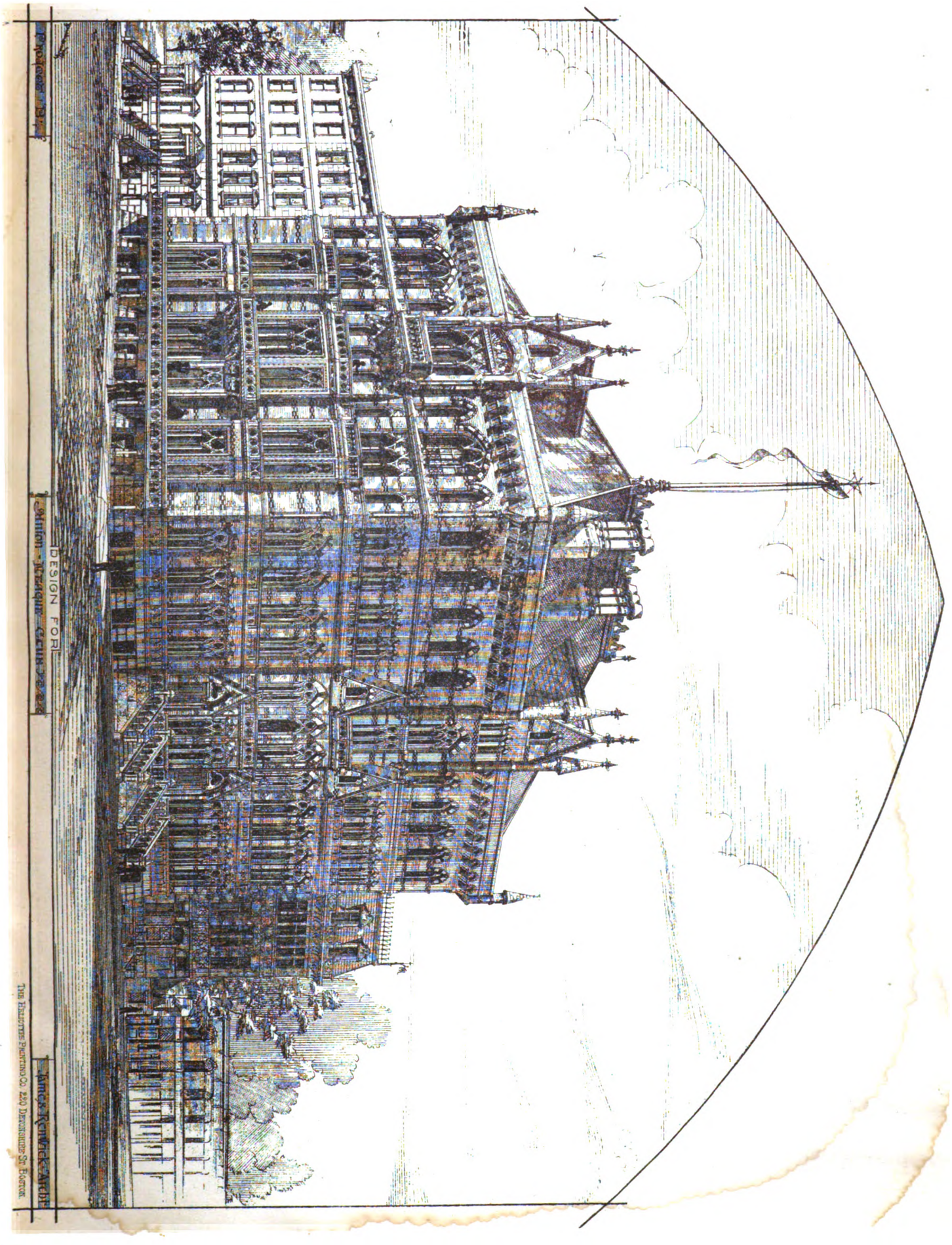

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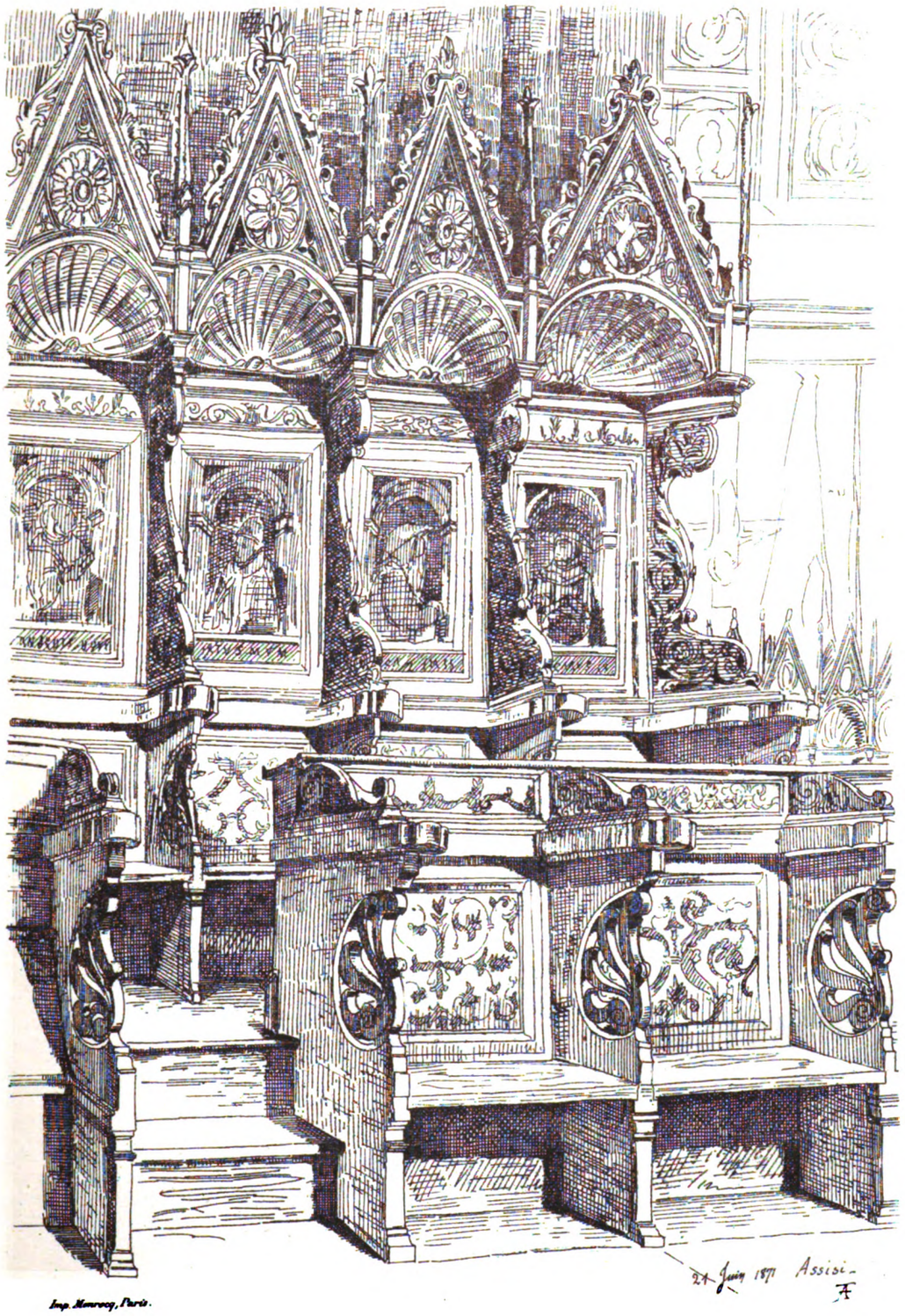

STALLES DE L'ÉGLISE HAUTE

DE SAINT FRANÇOIS A ASSISES (Italie)

d'apres un dessin de Mr Albert Thomas

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books, and the substitution of more detailed criticism of the appliances usual in this country. For example, the description and illustration of the rain-water cisterns of Venice, which could never, we trust, serve as a model for any other locality, might well give place to a more extended notice of our ordinary form of rain-water reservoir, of which thousands are in use all over the country, although not one in ten is quite satisfactory.

Few people know how to construct a good cistern; one which shall be tight and clean, whose roof shall not, as wooden ones generally do, condense slimy drops, to fall back into the water, whose overflow pipe shall serve neither as an inlet for drain gas nor as a highway for beetles, toads, or poisoned rats; which shall be well ventilated, but not liable to collect dust, and shall filter well and quickly, and never clog. Yet the differences between good and bad construction are easily explained, and should be described at length in a work so comprehensive in its intention as the present one.

The brief mention of driven wells also seems to us inadequate to the importance of the subject. They are described with artesian wells as a means for obtaining water from deep-seated strata, whereas the great majority of those in use draw only from the ground water, just as would a common dry well. Of the remarkable augmentation of the supply to tube wells, apparently by the atmospheric pressure called into action through the exhaustion of the air in the tube by means of the pump, there is no mention, nor of the easy mode of increasing the supply by connecting several tubes together above ground by means of ordinary Ts and horizontal pipes. We are as much opposed to the indiscriminate use of ground water for drinking as any, but if no other supply is attainable, the employment of tube wells saves so much risk of its contamination by surface water, insects, and other animals, which find their way down into the ordinary wells through the loose soil around the steining, if not over the top of the curb, that they deserve, and should have, a much more extended consideration.

Some illustrations of the common practice of well sinking and drainage, by which two holes are dug, in greater or less proximity to each other, into the same stratum of porous gravel, the household liquids being poured down one and pumped up out of the other, are repeated from the Massachusetts Board of Health reports, but there is no danger of enforcing such things too strongly upon the public mind.

Some suggestions about filtration of house supplies, following an extended description of filter beds on a large scale, will be interesting and useful to architects, as well as householders. Beginning with the little tap-filters, of which hundreds are sold weekly, Professor Nichols says plainly, "There is no known material which can be introduced into the small space of a tap filter, and accomplish any real purification of the water which passes through at the ordinary rate of flow." For straining the water, which is all that can be expected of such applianoes, he says that "animal charcoal in such filters has no advantage over clean quartz sand." We will add that it has a serious disadvantage, — that of harboring worms, which should prevent its use unless frequently changed. The sponge filters are better, but are also "worse than useless unless removed and washed with water every few days." Of the larger filters the author has a higher opinion, where proper attention is given them.

After a description of the different kinds of water-pipes and the modes of laying them, in which he mentions the common coating of coal tar for iron pipes, with commendation in which we cannot quite agree, knowing the strong taste which such a coating badly applied gives to the water, the paper closes with a very clear and sensible discussion of the modes of analysis and examination of potable waters. Speaking of the ordinary wells, the professor makes an assertion which will be credited by sanitarians, however violently it may be repelled by householders, that "a large majority of the shallow wells in actual use are so situated that they receive sewage either directly or indirectly." To prove whether a well receives taint from a cesspool, vault, or stable yard, he advocates throwing a quantity of strong brine into the suspected source of contamination, testing the well water for chlorides (by means of nitrate of silver), before and afterwards.

The treatment of water to ascertain the amount of organic matter present by means of the bleaching of permanganate of potash, which is very common, he considers unreliable in inexperienced hands. Another ready test, which is sometimes advocated, by dissolving white sugar in the water, keeping it in a warm place, and observing the turbidity produced by the developments of microscopic organisms, he does not mention.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK. MR. JAMES RENWICK, ARCHITECT, NEW YORK.

Two alternative designs are here given with the first and second floor plans of each.

STALLS OF SAN FRANCESCO, AT ASSISI.

These stalls are in the choir of the upper church in the two-storied Church of St. Francis at Assisi. The illustration is from a drawing by M. Albert Thomas, published in the Sketch-book of the *Intime Club*.

THE LAST PARIS SALON. I.

PARIS.

I RETURNED from Spain in time to see the Salon here, and, as undoubtedly the American papers have long ago given their *résumé* of it, I shall send some notes bearing particularly upon the American artists exhibiting. In view of the labor and anxiety involved in passing the ordeal of admittance, our pioneers, who boldly dare to place themselves side by side with the greatest from other countries, deserve our warmest sympathy and encouragement. It is so much easier to avoid this cruel public test and so much more agreeable to exhibit advantageously to admiring friends, that those who do exhibit here show a serious purpose in itself to be admired. I devote this letter to painting the more readily in that the exhibition of architectural drawings at the Salon was singularly uninteresting, — probably because the architects, having sent their chief projects to the Universal Exhibition, had nothing new before the opening of the Salon. The sculpture was of less interest than usual, so that the powerful figure of a genie guarding the secret of a tomb, by Saint-Marceaux, easily carried off the *médaille d'honneur*. It is a vigorous and fascinating figure, with its lithe limbs and savage eastern head; and shows a strong Florentine character which may be hailed as invigorating influence for the French school beginning to petrify under exclusively Greek models.

A generation ago it was the critics who carped habitually at the average works of art, and awed the enthusiastic public by cold reservations; but the secret once out, the trick was quickly caught, and now, the more ignorant an amateur is, the less likely is he to frankly admire anything, while the public in general have learned to look wise and shake their heads at exhibitions before any but acknowledged masterpieces. If one should believe the criticism heard annually in regard to the Salon, it would be difficult to measure its present degradation, for each year it is loudly proclaimed to be the worst which has been seen for several years. As usual this is heard on all sides in regard to the present exhibition at the Palais de l'Industrie, but all artists and critics are by no means of this opinion. There are, in fact, to the thoughtful observer, encouraging signs to be found in this year's Salon, which are the more unmistakable because the germs of this improvement were visible last year. Although it is true that this year's exhibition contains fewer remarkable works than did several preceding Salons, still, on the other hand, there are not as many bad pictures, and the average may be said to be quite as high as it has been the last few years, if not higher, and this with 3,040 oil pictures admitted against 2,330 last year. But the real improvement lies in the absence of the coarse and revolting subjects which were painfully numerous five years ago, and in a return to a more sober and refined style promoting conscientious and truthful study. There is, for example, a larger average of works which, in sentiment and execution, are appropriate for private houses, and it seems as if the taste for crude and violent effects, which the great size and strong light of the exhibition rooms tempted artists into for the sake of attracting attention, had given way to a more healthy ambition and a more practical use, for, however much of a sensation a coarse, large work may make, unless bought by the government there is little chance of its being sold.

There is still, however, a tendency to use too large canvases. I do not so much refer to such immense ones as Gustave Doré imposes upon the exhibition, — being *hors concours* (H. C.) he can send what he likes, and this year has a Death of Orpheus monstrous in all senses, — but rather to painting *genre* pictures on too large a scale, for costumed figures do not gain, but lose, dignity and character by heroic size. Then, too, many of the canvases are but scantily filled. It is, of course, well to give enough air and room to a subject, and the English and German schools have spoilt many a good work by crowding and cramping it, but the fashion here is rather to overventilate, so to speak, the subject, and not unfrequently the personages look rather as if set out for a game of base-ball. This is the principal fault in a picture by Mr. Walter Gay, of Boston. His Fencing Lesson is unfeignedly in the style of Fortuny, and shows the agreeable coloring and minute, if not very firm, drawing which characterize that school. The action of the figures is well-conceived and characteristic, and the modelling carried to a high finish. Beside the fault of too much elbow-room, the figures lack accentuation as masses; but the picture is one before which the public stop with signs of approval. There are comparatively few pictures in the Spanish style this year, which, considering the large collection of Fortunys gathered together at the Universal Exhibition, is remarkable, and perhaps significant. I believe that collection did much to correct the enthusiastic admiration for him stimulated by his untimely death, and which culminated in preposterous prices at the post-mortem sale. That Fortuny had originality and extraordinary natural facility, backed by an incredible capacity for work, is undeniable, and he certainly promised to become a great painter, but his works, considered as pictures, can only have a pernicious effect. They were only studies in which he worked up the bit which interested him, and for which the study was made, leaving the rest to take care of itself, whence impossible values and straggling composition. These careless faults seemed at one time likely to be accepted as merits, and actually are in Spain, but when a number of these studies were brought together their true character and purpose became more apparent. Fortuny is reported to have said a short time before his death, "I begin now to feel ready to paint a pict-

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ure.' That picture would probably be very different from anything which now exists. Of other Spanish artists who attracted attention at the Universal Exhibition, neither Rico nor Madrazo is in the habit of exhibiting at the Salon, while Escosura has only a small picture, and Gonzalès one which is quite unworthy of him.

Remarkable among the *genre* pictures of another style, Henry Mosler, one of our countrymen, has a work full of high dramatic and artistic qualities. His Return represents a Breton peasant who, reaching home after an absence, finds his mother dead. The whole story is told with a directness which gives an intense pathos to the scene. The painting and drawing ably second the composition, and it well deserved the honorable mention it received. Mr. Bacon, though living in France, is one of the few of our painters who has the courage — shall I say good sense? — to paint American scenes, and the attention which they attract justifies his patriotism. His Burial at Sea is an earnest realization of a terrible scene, — launching a corpse from the deck of one of our Atlantic steamers. There is a strong reality in the general movement, no less than in the individual attitudes, which is admirable. The lineal composition is good, but the masses of color want concentration to accentuate the central group. The effect as represented is, no doubt, true, but so tragic a scene justifies and requires the forcing of effects to realize the powerful impression which would be produced on the mind. The general coloring, though harmonious, is too thin and pale to appear to advantage in the strong glare of the Salon. Mr. Bridgman, of New York, sends a work which compensates for the falling off in his Salon picture of last year, and which, if no better than his remarkable picture of two years ago, — it was this Funeral of a Mummy which took a first medal in the Universal Exhibition, — shows the same distinguished qualities. His Procession of the Bull Apis has thought and research expressed with vigorous precision. Mr. Blashfield, also of New York, is equally drawn towards archæological subjects; though his "call" is not so evident. His Roman Ladies Practising in the Arena has, however, more life and movement than his previous pictures. As fine examples of what *genre* pictures should be I must cite *La Tournée Pastorale* of Worms, which is full of the character of Spanish life and admirably painted; and M. Salmson of Stockholm, in his Arrest of a Woman in a Village by *Gendarmes*, expresses with wonderful precision the various characters, and has composed a powerful picture. Of the battle scenes the most remarkable was Detaille's *Défense de Champigne*, full of unrivalled delineation of soldiers in action. In fact, there is too much individuality given to the men, and this, coupled with a want of simplicity in grouping, injures the composition. Mr. D. R. Knight, of Philadelphia, has so charming a vintage scene that one is grateful that no especial fault distracts the attention from its enjoyment. Agreeable in color and composition, it has a certain Anglo-Saxon purity of sentiment which is the chief merit of English painters; but Mr. Knight has what they rarely attain, — a free, vigorous, and solid style of painting.

Belonging to the *genre* class of pictures, though with figures almost size of life, is Herkomer's Home for Old Women. As in the picture of the Chelsea Veterans, which last year gained for him a medal of honor at the Universal Exhibition, he has chosen the most distinctively Anglo-Saxon types, which in itself attracts the French. The picture, however, though the old women are admirably painted, is badly composed. The picture of the Veterans was remarkable for no composition, which the subject allowed, but here the composition is unpardonable. The principal group is crowded into the right-hand corner, so that the frame promiscuously cuts off arms and legs, while more than half the canvas is occupied by a steep perspective of floor, and some small distant figures. R.

CORRESPONDENCE.

EPHESUS.

THE ÆGEAN, August, 1879.

THE water of the Gulf of Scala Nova, which is of so beautiful and transparent a blue near the hills upon which are the ruins of Colophon, becomes a little farther on turbid and defiled, so charged with foreign matter that it is scarcely possible to see the strange livid jelly fishes which float near its surface. The wind brings from the land the vapors which rise from a miasmatic swamp under the summer sun. It is the ooze and marsh of the Cayster, the stream which, after robbing Ephesus of its harbor by silting up the bar, has formed so pestilential an alluvion that the country for miles around is almost uninhabited, and at this time of the year is entirely deserted. I should doubt whether the land has encroached upon the sea as much as is generally supposed. The hills which rise from the midst of the plain may perhaps have once been islands, but hardly in the historical period. Ancient walls, with iron rings for mooring vessels, are quite near the present coast line; it is well known that the port of the city was connected with the sea by a canal. The position of this harbor basin is to-day marked by a forest of high rushes and flags, which map out the antique water-works to him who has climbed the neighboring hills, by a distinct dark green line. Ephesus was already swampy in the time of Xenophon, though being well drained it was not unhealthy. That much of the city lay on low land is evident from the success of Lysimachus in drowning the inhabitants out of dwellings which he considered too near the temple, by stopping their sewers during a heavy rain. Ephesus is the only site of Greek remains in Asia which is accessible by railroad. The ruins are on this account often visited, and almost invariably from Smyrna. Yet those who come to the city from the inland Ayassabouk lose many interesting characteristics of its ancient approach, the natural passage to the interior along the banks of the Cayster, which must in earliest ages have guided the sea-faring colonists. On the high and steep hill, conspicuous from the coast, there stands the tower traditionally called St. Paul's prison, the age of which has caused some discussion. Its well constructed walls, nearly a metre and a half thick, are of cut limestone laid without mortar, and appear of late Greek workmanship, a characteristic form being the pointed arch cut from horizontally projecting stones, — a mannerism common in Greek fortification walls after the time of Alexander. It seems not improbable that at least some part of the structure was built by Lysimachus. On this hill the primitive Greek acropolis may have stood, though as the rock was not levelled off sufficiently to give much extent, its importance can never have been great. The ruins of Ephesus are scattered upon the sides of this and the hill opposite, farther inland, and in the great natural amphitheatre which lies between them. They are in a state of utter destruction, a confused mass of Roman architectural details, shafts, architraves and archivolts, frieze and cornice fragments, wall blocks and pavement slabs, marble and granite, of every variety and color. Ionic details are everywhere prevalent, where details can be distinguished. The plans which can be traced give little idea of the form or destination of the buildings to which they belonged. A Greek peasant who comes through the thistles in the blazing sun, carrying the noonday meal to those who during the cooler hours of the morning have been at work in the tobacco fields of the fertile plain, points out a cylindrical mass of masonry as the grave of St. Luke, an antique substructure, whether of a monopteros temple like the somewhat venturesome restoration given by Mr. Wood, or of some other of the circular buildings of the later Greeks and Romans, is not clear. Its transformation for Christian usage is attested by the crosses upon it and by the cut through the stylobate. Another krepidoma may be so far followed as to show it to have been that of an amphiprostyle temple. Conspicuous upon the side of the farther hill are the remains of the great theatre; a rough measurement of the diameter shows it to have been about two hundred metres; a few bases of the proscenium are in place, but all is too much destroyed to be of architectural interest, and is withal too generally known to need description. In the crypt-like basement there are some curious Doric shafts with twenty-eight channels. Occasional fragments of Roman sculpture have been purposely mutilated, the heads being maliciously chipped from reliefs. Of Greek remains, or even of Roman workmanship, previous to the Christian era, there is very little; much reaches down to the Byzantine period, and this in turn is supplemented by the great mosque of Selim. The oldest building of Ephesus not entirely overthrown, though roofless and dismantled, this mosque would be eagerly torn down by archæologists were the Turks to permit it, because of the great amount of antique material which must have been built into its walls. Constructed in the fifteenth century, a time when even the sun of Byzantine Ephesus had fairly set, it took its stones freely from the remains of every period; its wide-spreading façade shows many a block of the temple; the granite shafts of its court of columns must have been polished by Roman artificers. Much material must also have been taken from the ruins to build the vast castle or barrack of Ayassabouk which stands near by, watching over the little town on the hill-side and the broad green expanse through which the Cayster lazily winds its way. The metropolis of Asia has become a deserted and pestilential swamp. The Artemision, the wonder of the world, uncovered from the earth which hid it for ages, can be traced only by a few basement stones; but the relation of the building to the city is the same; the chief interest of Ephesus centres to-day, as it did twenty-five centuries ago, in the temple of Artemis. Ten years ago its very site was unknown; one of the largest monuments of antique architecture had so entirely disappeared that the fact of its existence had even been doubted. Now the stereobate pavements of the three last temples have been found one over another. How many may have preceded these as the Artemision it is impossible to say. Judging from the history of the colonization of Ephesus, and from the architectural development of the Ionic style, the earliest stone peripteros may perhaps have been built here some time in the seventh century. One of the first was imitated in a Roman temple upon the Aventine, built by Servius Tullius (about 560 B. C.); all were of great dimensions. On the coasts of Asia, the threshold of the immense empires of the East, the Hellenic colonists seemed to share the Oriental taste for the colossal, and designed their temples upon a grander scale than elsewhere. The easy and light forms of Ionic architecture were adapted for their requirements; the early development of this style in the Ephesian temples seems to have been so marked that Ephesus was regarded by later antiquity (Vitruvius) without further questioning as the place where the Ionic style originated.

Many literary notices refer to the Artemision; the famous name of Crœsus occurs in the list of subscribers to it; accounts of the lavish expenditure in its construction are numerous; the most costly materials were employed; to it applies the only ancient mention of ebony as a building material. References to constructive peculiarities are particularly interesting. We are told that the temple was placed upon so marshy a spot that it might be exempt from the concussions of earthquakes. Architects of Samos, schooled, doubtless, by dealing

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with their own low plain, taught the Ephesians to lay a foundation of charcoal upon the swamp, even as we to-day would use a basing of sand coffers in similar circumstances. Peculiar systems of rollers brought the massive blocks of stone from the somewhat distant quarries. The thankful rejoicing of the city was without bounds when a shepherd di-covered a nearer ledge of marble, one that could more easily be used for the construction. The son of the Cretan architect who had originally drawn the plans laid the immense weight of the entablature gently and evenly upon the columns by emptying bags of sand from counter-balances. Now that a few stones of the structure have been found, we can easily verify the statement that the shafts were eighteen metres high. The exposed plan shows that the area covered by the last temple was more than four times that of the Parthenon, half as large again as that of Cologne Cathedral.

It seems strange that so vast a building, and so late intact (it could hardly have been injured before the advent of the plundering and destroying Goths in the third century A. D.), could have been so entirely hidden and forgotten that a laborious search of six years, and the expenditure of some twenty thousand dollars in trial pits, were necessary merely to discover its whereabouts, all this time, pains, and cost being but preliminary to the real excavations. A clayey soil of from five to seven metres in depth had been carried down upon it by mountain streams, situated as it was on the extreme edge of the plain. With five years more work and the further disbursement of sixty thousand dollars, Mr. Wood laid it bare, being rewarded by most meagre results. To-day the site of his excavations is a vast pit, its bottom more than half covered with stagnant green water, the abode of water-snakes and fevers. Here lie blocks of the last krepidoma, some seeming to show marks of a fire: broken bases, shafts, and capitals of bluish marble, not unlike the stone of Poros, and a few mutilated fragments of sculpture, not considered worth transporting to England. The tireless labor of Mr. Wood is well known, from his book, "The Discoveries at Ephesus." All has remained unchanged here since he ceased work five years ago. The site of the temple is much as it was represented in the illustrations of that time, — a few only of the better building stones have been carried off. Mr. Wood's restorations should perhaps be regarded with some allowance. Two ancient authors tell us particularly that the ceiling of the last temple was of cedar beams. The cuts in "The Discoveries at Ephesus" — perhaps, by the way, as good and straightforward a representation of the hypothetical hypæthron as can be referred to — have no ceiling at all. The results of the immense expense of time and money at Ephesus were decidedly disappointing. We are now perhaps able to say that the world-renowned temple stood in such a spot, and that the last one was of such and such general dimensions; but all that has been discovered has been of very little importance otherwise. As before said, the Artemision is practically all the city; the fragments of Roman and Byzantine masonry are not worth mention. Ephesus is a discouraging chapter in the story of modern attempts to uncover the remains of ancient civilization. The utility of excavations upon the site of cities which have died of old age, so to speak, may be questioned.

J. T. C.

BUILDING IN NEW YORK IN 1879.

NEW YORK.

THE first half year of 1879 makes a very gratifying exhibit on the books at the Department of Buildings, and real estate owners and builders have been more than surprised at the great activity in this line of business. This year was looked forward to with more than ordinary expectancy. The recovery from the panic was beginning to be seen and felt, and many were anxious to see whether the revival was a real one. Last year seemed to show a better spirit, and was encouraging, but the spring of 1879 was regarded as the crucial season, and the offerings, at the Department of Buildings, of plans for buildings were watched with more than the ordinary interest on this account. There was another influence which was to work very powerfully on the building interests, especially of the upper section of the city, — the elevated railroads, giving rapid transit from one end of this island to the other, a distance on the east side of some thirteen miles. There had been many promises from the managers of these lines of traffic; but it was not until June, 1878, that they were really open, and even now the system is far from its full development. It was almost too late then to build for that season, and many cautious investers preferred also to wait and see how far these air-lines were real successes and how far mere experiments. The winter demonstrated that they were capable of doing all that was promised for them, and the demand for residences in Harlem told the owners of real estate there that the time for immediate improvement and rental had come. The winter and early spring was spent in preparation, and the opening of the building season saw a great rush of mechanics into the section known as the rapid-transit wards.

The first quarter of this year showed an improvement as compared with corresponding quarters of previous years as far back as 1872. The 393 buildings proposed during the months of January, February and March, 1879, were not exceeded, as the following table will show; but the second quarter set all doubts at rest, and in number of buildings, as in cost, the figures ran up to anti-panic showings, and the total for the half year shows that 1163 separate buildings have been projected, at an estimated cost of eleven and three quarters million dollars.

The actual figures stand: —

YEAR.	1ST QUARTER.		2D QUARTER.		HALF YEAR.	
	No.	*Est. Cost.*	*No.*	*Est. Cost.*	*No.*	*Est. Cost.*
1868	432	$5,300,790	711	$11,704,926	1143	$17,005,716
1869	674	9,179,070	630	15,320,463	1304	24,499,533
1870	426	5,724,650	844	12,364,553	1270	18,089,203
1871	709	10,098,975	1006	16,002,576	1715	26,101,551
1872	445	5,718,640	690	12,412,150	1135	18,130,190
1873	330	5,320,940	502	11,969,025	832	17,289,965
1874	338	3,977,920	447	6,076,209	785	10,054,127
1875	334	4,765,300	477	7,223,200	811	11,988,500
1876	300	2,723,697	509	7,650,585	809	10,374,282
1877	325	2,776,530	495	5,437,975	820	8,214,505
1878	314	2,884,250	605	5,498,075	919	8,382,825
1879	393	3,131,663	770	8,616,889	1163	11,754,552

Taking the five wards to the north of Fortieth Street, the following table is constructed for the present year; it shows that of the 1163 buildings 898 are in these wards, and the better class of buildings, too, as the analyzed table exhibits: —

BUILDINGS.	12TH WARD.	19TH WARD.	22D WARD.	23D WARD.	24TH WARD.	TOTAL FIVE WARDS.	TOTAL IN CITY.
1st-class dwellings	159	199	44	7	—	409	434
2d-class dwellings	73	25	20	17	—	135	146
French flats	32	49	21	—	—	102	121
Tenements	21	116	11	—	—	148	253
1st-class stores	—	—	—	—	—	0	24
2d-class stores	—	—	—	—	—	0	8
3d-class stores	2	1	1	1	—	5	9
Office buildings	2	1	1	—	—	4	6
Workshops	5	6	6	1	—	18	45
Schools	1	1	—	—	—	2	8
Public buildings	3	4	—	—	—	7	14
Churches	—	—	—	1	—	1	2
Stables	2	8	7	4	1	22	46
Frame buildings	6	2	—	30	7	45	52
Totals	306	412	111	61	8	898	1163

Out of a total extent in the city of 24,893 acres these five great wards embrace 20,830 acres, but in many parts they are virtually wild, and the eighty-five or ninety thousand structures in the metropolis are crowded upon four or five thousand acres at the lower point of the island.

It is curious to observe that while in 1863 a total of 1143 buildings cost over seventeen millions of dollars, it is now proposed to put up 20 more buildings, or 1163 in all, at a total cost less by five and a quarter millions of dollars. It is not that the buildings are on the average of a meaner grade. The difference represents only the drop which has taken place in cost of material and labor, and the closer margins on which contractors are willing to take hold of pieces of work. The figures for 1879 do not represent any very heavy jobs. The plans for the Union League Club-House, put at an estimated cost of $350,000, have been entered since the report above quoted was made up, and with it comes a flat to cost $110,000, under the superintendence of C. W. Clinton, architect.

The prospect now is that the fall of the year will see no diminution in the rush of plans for approval, and unless some new cause to checkmate the movement should appear, it may be fairly said that the building trade of New York has indeed revived.

W.

A DECORATION FOR THE WALLS OF SCHOOL-HOUSES.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — I beg to suggest a method of decoration for the walls of school-rooms which may combine art and utility in connection with the use of color.

Very false ideas of the relative sizes of different states or countries are conveyed to our minds, in spite of all our efforts, by the school maps, and others that we use, because the maps are drawn with reference to the size of sheet and we have no standard constantly before us by which to gauge their respective areas.

Let us assume that we have at our command the whole side of a room on a party wall in which there are no windows or other necessary breaks in the surface. This whole square would represent the area of habitable land of the globe. It would then be divided by colors into the sections representing the areas of continents. Each continent then to be divided by color into countries, and each country into states. The impression of relative size would then be kept before the minds of the pupils, and could never be forgotten.

As an example, assuming that a common checker-board represents the State of Texas, we have sixty-four squares equal to about 275,000 square miles, or about 4,300 square miles to each square. The present German Empire would be represented by fifty squares; Massachusetts by a little less than two. On a large side wall the divisions, marked and named, would be conspicuous, even in the case of a state as small as Rhode Island.

The frieze could be utilized in stripes or lines of various colors to represent the length of rivers, the height of mountains, etc.

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An ingenious person could decorate the other walls by the graphical method in a very instructive way. For instance, five squares of the checker-board would indicate the area occupied by the whole cotton cultivation of the United States. A large portion of the graphical presentation of the facts of the United States census, as exhibited in General Walker's statistical atlas, could thus be appropriated to mural decoration. Yours very truly, E. A.

SOME EXPERIMENTS IN BURNING SLUDGE INTO CEMENT.[1]

Portland cement is manufactured from chalk or limestone and clay. The component parts of these materials vary very slightly, and therefore the manufacture is nearly constant. The average analysis of five large manufactories gives the following results, namely, lime, 56.21 per cent; silica, 24.44 per cent; iron, alumina, 12.1 per cent.

The manufacture of Portland cement from sewage is much more precarious. Sewage, according to my experience, varies in every place and during every hour, and consequently has to be carefully watched in order that the requisite quantity of milk of lime may be added. At Burnley, on certain days, large quantities of dye water come down, on other days butchers' refuse, and once or twice we have observed the sewers full of coal tar and oily refuse. All these facts have to be carefully observed, and only after careful experiments can the quantity of lime necessary to precipitate the sewage be determined. The resultant sludge at Burnley on an average only contains 46 to 50 per cent of lime, and therefore before it is fit to be burnt into Portland cement clinker, more lime has to be added. This is done after the supernatant water has been run off the sludge deposited in the tanks. The sludge has afterwards to be passed through a pug-mill in order that a uniform compound may be obtained.

At Birmingham, where Portland cement was also made, the sewage is so capricious that a uniform manufacture could not be guaranteed. This is accounted for by the fact that at certain times very large quantities of acid from the hardware manufactories of the town are poured into the sewers.

At Portsmouth, where I have studied the sewage, which has wholly water-closet and house drainage, there is little or nothing to interfere with the manufacture of a high class Portland cement. I believe the same remark would apply to the lower Thames valley sewage. The sewage requires only a small quantity of lime to defecate it; 16 grains of quicklime per gallon is ample. The sludge I have found generally contains from 58 to 60 per cent of lime, and therefore no fresh lime would have to be added. The fact that at Portsmouth the storm-water is partially kept out of the sewers is also greatly in favor of the manufacture of good cement. And in places where the separate system is in force, and where the proportion of water-closets is large, it would be, perhaps, worth while to allow the finely suspended organic matter to subside before liming, and to treat the organic matter described in General Scott's patent.

The sludge resulting from limed sewage may also be burnt at a lower temperature than that necessary to produce Portland clinker, and be re-used to precipitate the sewage. After this has been done several times the lime becomes rich in phosphates, and may be profitably sold as a first-class agricultural lime.

As a result of my experience I have arrived at the following conclusions: —

a. The sewage of every town should be carefully watched and experimented on before any plans or estimates are made.

b. The storm-water should, if possible, be kept out of the sewers.

c. A paved town is more favorable to cement manufacture than an unpaved one.

d. That manufacturing refuse, except acids, does not materially interfere with cement manufacture.

In conclusion, I may state that the cement now being made at Burnley is much improved in quality since the manufacture began, and much has been sold. The latest tests give excellent results. Mr. Deacon, borough engineer of Liverpool, reports the tensile strain of 695 pounds on the 1¼ inch square, and that the cement passed through a sieve of 50 meshes to the inch, leaving only 7 per cent of residue. The latest test at Burnley gives 698 pounds.

A portion of a sea-wall at Portsmouth has been built with it, and it has stood this test remarkably well.

Much has been learnt since the process was first started at Burnley, and it may be fairly expected that towns will obtain purification, and at the same time will recover the greater part of the cost of so doing, by adopting this process.

[1] Portions of a paper by Granville Cole, Ph. D., printed in the *Journal of the Society of Arts*.

NOTES AND CLIPPINGS.

A Statue to Bruce. — A fine statue of Robert Bruce, the hero king of Scotland, was unveiled Saturday, September 13, in front of the town hall at Lochmaben, Scotland, in the presence of a vast concourse of people. The statue is carved out of close-grained freestone, and stands upon a pedestal of Dalbeattie granite. Pedestal and statue together are eighteen and a half feet high, and are placed in a very conspicuous spot at a point previously occupied by a large cross. Bruce is represented as a sturdy warrior who has accomplished his task, but is ready, if need be, to strike yet another stroke for the cause he has made his own. He appears in a mediæval shirt of mail and loose upper tunic, yet with a crown and royal mantle. His attitude expresses resolution; his right foot is advanced, and the weight of his body is thrown upon the left, as he is supposed to have stood while presiding over the great convention of the estates of Scotland, at Arbroath, 1320, to protest against the threatened interference of Pope John in support of English oppression. The head has been designed according to hints supplied by an ancient silver coin. The people of surrounding towns joined with the people of Lochmaben in thus doing honor to the memory of the conqueror, and the festivities of the occasion lasted through the day and far into the night.

Hunt's Last Days. — The *Sunday Times* has the following anecdote of Hunt: —

I hear a characteristic anecdote about Mr. Hunt from Mr. Loring, the publisher. Several years ago Mr. Loring engaged Mr. Schoff, the well-known engraver, to do an engraving of Rev. George MacDonald for him. He sent to England for a photograph, which he forwarded to Mr. Schoff, who was then in Washington. Mr. Schoff sent it back with the words that he could do nothing with it as it was, and asking Mr. Loring to go to Mr. Hunt and request him to furnish a sketch after which he could work. "Tell him it is for me and he will do it," said Mr. Schoff. So Mr. Loring went to Mr. Hunt's studio on Summer Street, — it was before the great fire, — and found a notice on the door, "Engaged; positively no admittance." He knocked, however, and Mr. Hunt came to the door with palette in hand. Mr. Loring explained his errand, and Mr. Hunt said, in his abrupt way, "Oh, I am altogether too busy to do anything with it; have just had to refuse an order from Gardner Brewer." He paused a moment, and then said, "Did Mr. Schoff send you to me? Let me see it!" And taking the photograph and scanning it instantly with his marvellously quick, keen glance, he made about half a dozen pencil dashes on it and handed it back with the words, "There, send him that! That will show him what to do." He had not taken half a minute in doing it, but the few simple lines were enough to tell Mr. Schoff just what was wanted, and he produced a remarkably fine engraving.

Signor Brumidi. — Signor Brumidi, the artist who has been employed for many years painting in fresco the Capitol at Washington, narrowly escaped a frightful death while at his work two or three days ago. He was painting upon the circle of historical figures which he is making around the dome. His scaffold was about sixty feet above the tiled floor, and in attempting to touch with his brush a point at one side he was forced to lean over. The chair in which he was seated toppled, and he was thrown over the side of the scaffold. As he fell he grasped with one hand a rung in a ladder, and sustained himself until one of his assistants reached him. He is very old and so feeble that he can scarcely stand upon his feet. He was completely prostrated by the nervous shock, and i is doubtful if he ever entirely recovers.

The California Debris Question. — W. C. Schaffer, of Sutter County, proposes to take the whole of the Yuba River, at ordinary stages of water, through a double flume, down into the low lands between the Yuba, the Sacramento, and the American Rivers. He suggests a double flume, with riffles in each, for the purpose of running one of them at a time, and catching the fine gold. He thinks that the gold thus caught would alone pay the interest on the cost of the flume, which he estimates at $10,000,000. Under Judge Keyser's decision, which is most likely to be affirmed, it is the miners' business to provide means of taking care of the débris. Under this plan the whole basin, some 100,000 acres, would have to be condemned. The flume could then be carried to that part of the land nearest the foothills first, and that filled in, say twenty feet above the bank of the river, and then moved towards the river, making land as it went. It would take two or three generations to fill the whole in, but a great deal of land would be made every year.

The Caricaturist "Cham." — The late Count de Noé looked more English than French. He was a tall, carefully dressed, and serious man, with a long, fair mustache and an erect carriage. He had an astonishing facility for work, and he worked without fussiness, anywhere and anyhow, without ever wasting a minute, and yet without intruding the fact of his being busy on the notice of others. He was always ready to receive visitors; and in his home circle he was the least tyrannical of men, one who never scolded or fretted, and who was in fact so uniformly gentle as to be almost puzzling. He never spoke evil of anybody; his very drollest sayings were flavored with a mild kindness, yet he knew so many things, and the judgments of his facile pencil revealed such a depth of shrewdness, that one was often tempted to suppose that he held in his tongue with a bridle. The genius of "Cham" was twofold: he was an admirable caricaturist and he was a wit, for the letterpress under his sketches was always of his own writing.

Fire Department School. — The fire department school of instruction will be reopened in Chicago. The school is held one day in each week during the winter months. The programme of instruction marked out for the ensuing year is: 1. Combustible and explosive oils, especially kerosene, gasoline, and that class of hydro-carbons most in use at present; their nature; their use; their danger; how they may be used safely. 2. Other combustible matter, showing gradual spontaneous combustion. 3. Explosive compounds. 4. Causes of fire in paint shops, drug stores, warehouses, wooden roofs, asphalt roofs, and defective chimneys. 5. Buildings where steam power or steam pipes are used; the danger thereof. 6. Boiler explosions, the cause, and how to prevent the same. 7. Lightning as a cause of fire; lightning-rods, their construction and utility. 8. The chemical engine, its principle and use. 9. Engines, their nature; pumps and vacuum. 10. Effect of fire upon iron, granite, marble, sandstone, and brick. 11. Electricity. 12. Laws of falling bodies.

Elevator Accident. — The rope of an elevator in a Manchester mill broke Friday, causing the elevator to descend with lightning-like rapidity, and Thomas McNally, aged 14, who was riding upon it, jumped from a three-story window to save himself, and received a broken hip.

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WE have not, at our day of writing, learned the conclusion of the coroner's inquest on the Adrian disaster. The testimony given in the course of the examination is, as usual, somewhat vague, and conflicting enough to make it probably a difficult matter for a jury to distribute their blame. We say distribute, for without attempting to anticipate the verdict, or to decide who was most in fault, or where the technical responsibility lies, we can easily see by the evidence — and here is the real significance of the accident, for it typifies the conditions under which such building as here led to disaster is done all over the country — that nobody concerned in the building of the stand at Adrian had any adequate idea of what he was doing. The person who has been spoken of as the architect of the stand (and we notice that where a building comes to disaster the designer of it is always punctiliously spoken of as an architect) was not an architect, but a carpenter. He did not design the stand, but went, by request of the proprietor, to Toledo, where he examined the stand there, and, returning, made general drawings, without details, for one in imitation of it, with a description or specification in explanation of them. For this service he received five dollars, his chief interest in it being, as he said, the expectation of doing the work himself under contract. He was outbid, however, by other persons. The mechanic who did the work was not a master-builder, but a painter, who had picked up what knowledge he had of building as he went along, and made no pretence at his examination of being able to judge of the proper strength of such a structure. The proprietor had, it seems, some anxiety for its strength, and made his builder brace it with a number of iron straps, which were not called for by the specification. He even proposed putting in iron rods across it, but this was pooh-poohed by Mr. Sizer, who made the plans, and who, having been requested to examine the work when it was done, gave it his approval, so that the rods were not put in.

A FEW particulars of the evidence are enough to show the main facts and their essential bearing. Mr. Sizer testified that, having visited Toledo at the request of Mr. Lawrence, the proprietor, he made general plans and specifications for the stand at Adrian, but not such plans or specifications as he should have made for other mechanics to estimate from. He did not, however, explain to Mr. Lawrence that the plans and specifications were incomplete, although he considered that the builder, Mr. Armstrong, was not competent to carry out the work properly. The builder testified that he was a "carpenter and painter," but principally a painter; had learned his building in the car-shops, without having served any apprenticeship; and did not claim to be competent to build from an architect's plans. He nevertheless perceived that in Mr. Sizer's plans all the cross-sills and seven of the posts were omitted, which Mr. Sizer agreed was possible. He put the building together entirely with nails, because the specifications called for nothing more, only the sills being framed together, and even the braces being merely "toe-nailed" to the posts and plates. Some of the workmen found the frame unsteady, but when the seats were put in it stiffened up. At Mr. Lawrence's recommendation, he spiked some iron straps to the front posts; but when Mr. Sizer inquired whether the bracing joists were spiked to the girders it appeared that they were not. Mr. Sizer replied that he could spike them at any time, — and he did not spike them. As for the outside persons who expressed fears that the stand was not secure, he considered that they did not belong to the Inspecting Committee, and disregarded them. The designer of the stand in Toledo which served as a model testified to the insufficiency of the plans at Adrian, and especially to the omission of ties to keep the roof from spreading, admitting, however, that those which had been put in at Toledo were an afterthought. The inevitable inference from all this is that the coroner's examination will amount to a certificate of general incompetence, and that, as we have intimated, there was no one at hand who knew what sort of precautions were necessary, or even was sure that any were needed. The ominous thing is that this simply typifies a condition of things which is common all over the country. The only exception to the general *laissez-faire* seems to be that of a bridge-builder, who was at work elsewhere on the grounds, and who, after inquiring "what kind of a damned dead-fall they were putting up there," dissuaded his friends from risking themselves upon it.

SINCE the above was written we learn that the coroner's jury has rendered a verdict which, so far as a coroner's verdict can, makes the case exemplary. It finds that Mr. Sizer was guilty of criminal negligence in preparing the plans and specifications for the stand; that the builders, Messrs. Armstrong, being incompetent mechanics, were guilty of criminal negligence in undertaking such a construction, and grossly negligent in the way they carried it out; and that Mr. Lawrence, the proprietor, was also guilty of gross negligence in employing such incompetent men, and further negligent in not examining the methods and principles on which his stand was constructed. It recommended that these persons should be held for murder or manslaughter resulting in the death of Mr. Johnson, whose death was made the occasion of the inquest. Thereupon warrants have been issued for the arrest of them all on the charge of manslaughter. The verdict satisfies the feeling of the community, which is greatly excited by the injury to its members, and which was in not unnatural fear that, as must often happen in like cases, the inquiry would result in bringing nobody to the bar. How far its judgments will be borne out by the more deliberate decision of the court remains to be seen. As far as concerns its assignment of blame, doubtless the coroner's jury is right; when it comes to the assignment of responsibility, there is some question how far such sweeping doctrine is judicious. Men who assume to do the work of architects and engineers in planning structures to which the safety of other persons is to be trusted, should fairly be held to competency, and the punishment of manslaughter is not too great for the fatal result of flagrant incompetence; without this there is no general safety. Mechanics who assume to do work on which life depends should be held responsible for the mischief of negligently and incompetently carrying out the directions given them. Both these classes make it their trade to do work which, if badly done, imperils the lives of others, and they should be held to do it properly.

IN the same way the owner who endangers people by carelessly employing incompetent agents cannot, perhaps, with safety be left to the discipline of his personal losses, and it may do to assume that he can always find competent agents if he will. Certainly there is very great need to enforce upon the community the paramount importance of employing competent constructors. But it is claiming too much to say that the employer must acquaint himself with the "methods and principles" of the construction he orders built. In many cases this is impossible, and in most not worth while. It is better to leave the entire responsibility with those whose business it is to prescribe the methods and principles. It is desirable, too, that in this case the proprietor should not be regarded as an exceptionally guilty person. The lesson of the disaster will be in great measure lost unless it is realized that the Adrian disaster is only a warning of what our whole community tends to. It is happily exceptional in its result, but not at all exceptional in its conditions. The whole public should be led to see themselves vicariously punished in Mr. Lawrence, who is after all but a representa-

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tive man. The probability is that the majority of his neighbors — the majority of all men under like circumstances — would have done pretty much what he did; that is, would have turned to whatever carpenter happened to be at hand, and asked him for a plan, and then would have given out the work to any tolerably promising mechanic who bid lowest for it, without inquiring curiously into his knowledge of his trade. The public authorities do the same thing, and are expected to, even up to the United States Government itself. Every mechanic who appears to be solvent claims a right to enter all public competitions and to consider himself defrauded if he is not treated as the equal of any other. The stand that fell in Blackstone Square, Boston, during a celebration two or three years ago, was built under the same general conditions of ignorance and lack of supervision, — excepting that in Boston, as in the other older and larger cities, the general standard of construction is better than in the smaller and newer towns of the country, — and the result was the same. It is to be hoped that the community which is exasperated at the calamity in Adrian will not forget that the most important thing of all is to reform our own ways, and that punishment of the offenders is of use only as it points to that. In the matter of construction we are the most reckless people in the world. The lesson of the calamity will be lost unless it helps us to insist on a higher standard of competency on the part of designers and mechanics, a better appreciation of this competency and a better habit of building on the part of the public.

We find the English building papers occupied with a variety of competitions that have a familiar ring. The town council of Greenock, Scotland, the great ship-building town on the Clyde, having determined to build a town-hall, or "Municipal Building," has lately held a competition for designs, in which, after promising some small premiums as consolation to the defeated, it offered a commission of four per cent to the successful architect for full services. The competition was, so far as we hear, properly conducted, and fifty designs were sent in. Mr. Charles Barry, president of the R. I. B. A., was called upon to give his opinion concerning them, who selected what he considered the best six. Among these the council chose three, to which they awarded the premiums, and have adopted for execution the one they put first, on condition that the architect shall give a written guaranty that the building shall not cost more than eighty thousand pounds, after the Town Works Committee and the Police Commissioners shall have made "such modification and rearrangement of the buildings as they may deem necessary." The terms of the competition have roused some irritation in the profession, and Mr. Barry, before the council arrived at their decision, appealed to them to reconsider their resolve fixing the architect's fee at four per cent instead of five. The council, however, decided not to "alter the rate of commission upon which all the competing architects had sent in their plans." In like manner, the small town of Staines has advertised for designs for a town hall, for the more modest cost of twenty-five hundred pounds; but, improving on the example of Greenock, has fixed its architect's compensation definitely in advance at one hundred pounds, or four per cent on the intended limit, whatever the actual expenditure may be. This, again, has excited some professional indignation, and we notice in both the *Builder* and the *Building News* protests from architects who hope their brethren will let the uninviting competition alone. Notices and correspondence concerning other competitions are full of complaints, the like of which are very familiar to American ears.

It appears, then, that our English brothers have the same difficulty with competitions that we have at home. They, like us, are enticed by competitions into doing work for less than the profession considers to be its due remuneration, and we must say of them, as we have said of the profession in this country, that it seems to be mainly their own fault. There are too many architects in the profession, both here and there, who, like hucksters in the markets, will ask one price and take another, or who, when the regular asking price is plainly out of the question, will take what they can get. Now it is of little use to complain of municipal governments being stingy. It is their trade to be stingy, and it is idle to expect them to pay five per cent for what they know that four per cent will bring, while it cannot increase their respect for architects to find that they can always get them to do work for less than they ask. If the architects whom the Greenock council asked for plans had refused to compete, and if Mr. Barry had declined to act as referee in a competition which he considered to be unfair to his profession, the authorities would doubtless have modified their programme, or if they did not would at least have had convincing proof of their mistake. But when fifty architects had submitted plans on the terms offered by the council, and the president of the Royal Institute had consented to act as adviser, it would have been rather strange if the council had not refused to alter the terms in deference to any subsequent protest. Architects who take part in a competition accept its terms, and therefore cannot either with dignity or effect complain of them after the decision. Neither in England nor here at home do building-committees or town-councils show themselves disposed to respect subsequent complaints; and it is not so very singular if they are led to look upon architects as a querulous and weak-kneed lot, who can always be got to work for less than they claim; or if in both countries the effect of the common professional attitude is to invite rough handling, or if, as one of the protesters in the *Builder* writes, "the profession is losing caste and its members have in a great measure to thank themselves for it." The time to protest is before a competition is accepted, and the way to make an effectual protest is to refrain from entering it.

The truth is, there is an inconsistency between the claims of architects and their acceptance which is demoralizing. The public notices it and takes advantage of it, to their trouble and discredit. The profession as a whole claims — to take the most salient instance of an inconsistency that has many phases — a fee of five per cent on cost for its services, and the careful and self-respecting part of the body insists upon this as a rule. But the beginners, the obscure, the hungry, the speculating, and in many contingencies the average practitioners, will work for a less fee. In the case of any considerable public building the civil authorities or the building committee find that they can go into open market, and have offered to them the services of as many architects as they please for a less fee. They even find that men whose popular repute is high will sell their services cheaply rather than let a tempting piece of work go by, and they see that nearly all work is tempting. Under these circumstances it is useless to suppose that they will not cheapen their architect's services, since cheapening is their business, or that they will be moved by the complaint of those who are at bottom acquiescent. It would be better for architects on all accounts if they would meet the public more squarely. The long experience of the profession the world over has led them to conclude that they are not fairly remunerated for faithful service by less than five per cent; but if they think they can afford, on the whole, to work for four per cent, they ought to say so. If they cannot afford to do it, but think it better to do work for that than to let it go, and look for their real remuneration to the work for which they get their full fees, they are playing a dangerous game, for they are inviting a pressure which, in the long run, they will find it hard to withstand. If they go on the principle of taking all the work they can get for just what fees they can get, their position is at least undignified in itself and hurtful to the profession, and, considering the double face they are forced to present to their clients, we cannot easily call it anything less than dishonorable.

The *Western Architect and Builder*, of which we have received the October number, complains that we meant to charge it with fraud when we said, in our notice of its first number, that it promised six plates, but gave in that number eight (*American Architect*, September 20, 1879), and believes that we wish to prejudice our subscribers against it. We can assure its editor that it never entered our head that there was any fraudulent intent, and we should be sorry if our readers received such an impression from us, but we do not believe that they did. As for our subscribers, we recommend them not to be prejudiced by our notice, which the editor apparently does not like, but to buy the new journal and judge for themselves. We do not expect even the most ambitious of new periodicals to show at the outset their whole capacity, and the *Western Architect and Builder*, having now a publishing company behind it, will, we may trust, take advantage of the opportunity for improvement furnished by the promise of a long career. Most journals, when they look back at their own beginnings, do not feel that they have great reason to be proud of them. Possibly the *Western Architect and Builder* may in time come to a like state of mind.

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THE OPEN FIRE-PLACE. XVI.

SUGGESTIONS FOR THE IMPROVEMENT OF THE OPEN FIRE-PLACE.

If we were to see a tribe of savages sitting astride of locomotive steam engines, and, in their ignorance of the application of steam, using them as we do ordinary carriages dragged about by horses, we should be inclined to turn up our civilized noses and smile at the exhibition of simplicity. But if, when these savages learned how a single engine, with its strength properly applied, was capable of doing the work of the entire tribe, they should, instead of applying steam to the engines already built, continue to use them only as carriages, and build others to act as motors, we would have before us an example of extravagance and folly only equalled by our own in our method of heating.

We fill our houses with open fires and use them only as radiators, although we know that the heat of a single one properly applied would be capable of doing the work of the entire house. Instead of applying furnace pipes to one of the fire-places already built, we continue to use them only as radiators, and build others down cellar to act only as air-heaters.

If the savage condescended to criticise he would have the right to say, "With all your boasted civilization you are even more barbarous than we, because, while it is true that we lose the motive power of our carriages, we are still able to use the carrying power of our motors. You, however, lose both the smoke heat of your upper furnaces, and the radiant heat of your lower ones."

We have shown that open fires as they are now used are incapable, without external aid, of properly heating our buildings. The air supplying the draught must, by some means, be moderately warmed before it enters. It should not be as warm as the walls of the room, nor cold enough to occasion discomfort to the occupants. This preparation of the air is usually effected by a furnace in the cellar, and the result of the combination of furnace and fire-place is, *under proper conditions*, and with all precautions taken against gas,[1] satisfactory except from the one stand-point of economy. With it every desideratum given in our description, at the beginning of these articles, of ideal perfection may with care be obtained, excepting the first and all important consideration, "that all the heat generated by the combustion of the fuel be utilized in heating and ventilating the house, and that the combustion of the fuel be complete." To satisfy this condition it is evident that the furnace and fire-place must be combined in one apparatus, for it is only in this way that a single fire can do the work of both.

How this combination can best be effected, and what sanitary and pecuniary advantages may result therefrom, it is the object of this chapter to inquire.

In our historical sketch we have shown to what extent and by what steps the work has been advanced up to the present time. It reaches its fullest development in the fire-place described by Peclet, Fig. 125, but excepting in this we find no evidence of an attempt to give the air-heating surfaces an extension in the slightest degree proportionate to the size of the grate or to the amount of fuel consumed, or to adapt the improved methods and forms of the hot-air furnace to the new conditions imposed. The air-heating surfaces are small and insignificant compared with the size of the grate, and are confined in most cases to a very small area in the immediate neighborhood of the fire. In the Dimmick Heater, with a grate surface of about a tenth of a square meter, we have a radiating surface of scarcely a square meter, or about ten times the grate area. In the Fire-Place Heater,[2] the Jackson, Joly, Fondet, Cordier, and other similar heaters, the proportion is the same, or but little greater. Yet in our best modern furnaces it mounts to from thirty to two hundred times the grate area.

The Sanford's Challenge Furnace, No. 40, for instance, to take an American example, has a heating surface of seventy times the grate surface. According to Bose, the proportion should be one hundred and sixty or one hundred and eighty to one, and according to Morin, from one hundred and eighty to two hundred to one, though in American practice it is seldom over fifty to one, with a heating efficiency of perhaps sixty or seventy per cent of the total heat produced by the fuel. The Peerless Furnace (No. 16), with a grate area of 0.13 square meter, has an air-heating surface of 6.7 square meters, or fifty-one times its grate surface. The Chilson (No. 8), the Golden Eagle (No. 8), the McGregor (No. 4), and the Soapstone Furnace (No. 18), have respectively, according to measurements made by the writer, heating surfaces of forty, fifty-six, thirty-one, and seventy-four times their grate surfaces.

Our ventilating fire-places, then, should have a much greater air-heating surface than has heretofore been given them, if we would obtain from the fuel the greatest amount of heat possible.

In a furnace all the air which enters the fire-pot is brought into close contact with the fuel by the position of its entrance below the grate. The amount of air entering the smoke flue is, therefore, but slightly in excess of what is actually required to support combustion, and its temperature is correspondingly high. But with an open fire a greater amount of cold air enters the flue, and its temperature is lowered in proportion. It may, therefore, reasonably be asked if this cool air from the room would not so much diminish the heating power of the flue as to render its development into a complete furnace useless.

This first and most important consideration should be carefully looked into before we proceed further, and any conclusions reached by reasoning should be tested by actual experiment.

Theoretically, wood perfectly dry requires for each kilogram burned, say, ten cubic meters of air, developing, say, 4,000 units of heat. The temperature of this air as it leaves the fire would therefore theoretically be $\frac{4000}{10 \times 1.3 \times 0.24} = 1{,}282°$ C., which is about the melting point of steel. So that a certain quantity of air beyond what is absolutely demanded by combustion is necessary to prevent the destruction of the furnace. Were twenty cubic meters of air instead of ten used, the temperature of the air would be 641° C., or sufficient to raise iron to a dull red heat. In an open fire-place with a contracted chimney-throat tested by the writer, a little over thirty-five cubic meters of air per kilogram of wood passed up the flue, and its temperature, as tested by a chemist's thermometer placed in a hole perforated in the flue for the purpose, rose somewhat above 300° C. In another fire-place having a larger throat, much more air entered, and the temperature of the smoke in the flue could not be raised above 200° C. with the same quantity of wood burned one kilogram at a time. But with a throat contracted still more than in the first fire-place, a still higher temperature of the smoke was obtainable, showing that by regulating the size of the chimney-throat, any temperature of the smoke may be easily obtained up to four or five hundred degrees. When hard coal is used for fuel, a good draught is necessary in order to produce a combustion of the requisite rapidity to heat the house. When the feed-door of a furnace is left open, this draught may be insufficient where hard coal is used. But where soft coal or wood is used, as is generally the case with open fires, no difficulty is found in obtaining ample heat with the feed-door standing open.

In an open fire-place the chimney-throat corresponds with the feed-door of a furnace, and it is this which regulates the amount of cool air entering the chimney, and not the size of the fire-place itself. When this throat is small, the hot products of combustion will fill it to the exclusion of the cold air from the room, and the temperature of the smoke in the flue will be high independently of the actual size of the fire-place.

It must be borne in mind that the flues of a furnace do not heat the fresh air by *radiation*, but by convection or contact of air. With *radiation* the higher the temperature of the heating surface the greater the proportion of heat given out. But with *convection*, according to the researches of Dulong, the yield is, for all practical purposes, irrespective of the absolute temperature of the heated body, or of the difference of temperature between the heated body and the air in contact with it. With a *radiant* body at a clear red heat of 1,015° C., the amount of heat transmitted per meter per hour is about 300 times that transmitted at 100° C., and at a bright white heat of 1,415° C., it rises to 4,604 times that amount! The extreme rapidity with which a body at white heat cools down to orange and cherry red, etc., indicates that at high temperature the loss of heat is exceedingly great.

With convection, however, the loss of heat is comparatively slight. Supposing that with the heated body at 0° C. and the air at 15° C., the loss by contact or by radiation were 1, at 250° C. it would be by contact only 1.9, while by radiation it would be as high as 3; at 310°, 510°, 1,015°, and 1,415°, the loss by contact would be 2, 2.3, 2.7, and 2.9 respectively, while by radiation it would be 4, 13, 300, and 4,604 times greater respectively than at 0°.

There is, therefore, with furnaces no gain of heat in quantity to compensate for the loss in quality by having the heating surfaces raised to a high temperature.

For a given amount of fuel the same number of units of heat will be generated by combustion, whether the combustion be slow or rapid. But where it is rapid the products are carried away more rapidly, and the loss of heat at the top of the chimney is greater.

Bernan, treating of furnaces, says: "When only a small quantity of air passes through the stove, the cockle is in danger of being overheated. Mr. Sylvester says, 'the cockle surface should not rise above 280° (F.). Beyond this it has a tendency to injure the materials of which the flues are formed. It is also heated with less economy, since, as has been observed, the smoke will pass away at a higher temperature.' The temperature of the surfaces he recommends is, however, a great deal too high; and much of the prejudice against stoves has arisen from this circumstance. Were the surface never to exceed 130° (F.), although the size of the stove would be increased, the salubrity of the air as well as the economy of the fuel would be increased also."

Theoretically, therefore, the temperature of the smoke in the flue of an ordinary fire-place, with its throat properly contracted, is sufficiently high for our purposes, and may be regulated at pleasure.

To put the matter to practical test, the writer has made numerous experiments, with the following results:—

A furnace of wrought-iron was constructed for the purpose, having a radiating surface above the fire-box of 7.5 square meters, or equal to that of a Magee furnace, No. 24. This was attached to the top of an open fire-place (the Fire-Place Heater), which served as the fire-pot, grate, and ash-pit. The apparatus was tested alternately with the feed-door (sliding blowers) open and shut. In each case

[1] It is probable that the use of steam for heating this fresh air will become much more general, and that in cities and towns steam-pipes like gas, drain, and water-pipes, supplied from a central source, will take the place of furnaces in places where open ventilating fire-places are found inconvenient or insufficient. Any improved form of apparatus for heating air by *indirect radiation* will assist, but can never supplant, the open fire-place.

[2] The jackets surrounding the heater add considerably to the heating power, but cannot, of course, be included in the estimate of direct heating surface. They correspond to the casing of a furnace, and might be extended *ad libitum*.

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three kilograms of wood, containing ten per cent of water, were burned, and it was found that nearly the same amount of heat was obtained from the flues, whether the blower was open or shut, the throat being small and the fire brisk. Sufficient air entered to keep the pipes from becoming red-hot, but not enough to reduce the temperature to too low a point. Therefore while all danger of burning or injuring the air was avoided, the heat was utilized to the best advantage.

Tables VIII. and IX. give in a condensed form the record of two of the experiments referred to.

TABLE VIII.

Temperature of the outer air, 22° Centigrade; of the room, 22° Centigrade; size of fresh-air opening, .05 square meter.

Door Closed.

Time: September 2, 1879, A. M.	Temperature of the Fresh-Air Current.	Velocity of the Air in Meters per Minute.	Cubic Meters of Air entering the Room.	Difference of Temperature between Outer Air and Air entering Room.	Equivalent in Cubic Meters raised 1° Centigrade.	Weight in Kilograms.	Temperature of Room.	Thermometer in the Direct Radiation of Fire-Place at one Meter distant.	Remarks.
1	2	3	4	5	6	7	8	9	10
8.10	22	0	0	0	0	0	22½	22	Fire lighted.
8.20	49	63	3.	27	294.3	294.3	23		Second kilogram.
8.30	73	54	3.	51	1028.8	1028.8	24	80	Third kilogram.
8.40	83	78	4.	61	1893.	1704.	26	81	
8.50	68	36	2.	46	1178.	1178.	26½	80	
9.	54	30	1.5	32	723.	723.	26	77	
9.10	48	27	1.3	26	351.	356.	26	76	
9.20	42	25	1.3	20	258.	283.	26		
9.30	37	25	1.3	15	191.	210.	25	75	
9.40	36	25	1.3	14	178.	196.			
9.50	35	22	1.1	13	138.	150.			
10.	33	22	1.1	11	125.	137.			
10.10	32	22	1.1	10	114.	125.			
						6415.			

TABLE IX.

Temperature of the outer air, 25° Centigrade; of the room at beginning of experiment, 26° Centigrade; size of fresh-air opening, .05 square meter.

Door Open.

Time: September 2, 1879, P. M.	Temperature of the Fresh-Air Current.	Velocity of the Air in Meters per Minute.	Cubic Meters of Air entering the Room.	Difference of Temperature between Outer Air and Air entering Room.	Equivalent in Cubic Meters raised 1° Centigrade.	Weight in Kilograms.	Temperature of Room.	Thermometer in the Direct Radiation of Fire-Place at one Meter distant.	Remarks.
1	2	3	4	5	6	7	8	9	10
3.32	27	0	0	2	0	0	27	27	Fire lighted.
3.42	49	39	1.9	24	239.7	263.7	29	88	Second kilogram.
3.52	67	57	2.8	42	861.0	861.0	30	94	Third kilogram.
4.2	91	78	3.9	66	2002.8	1802.5	32	107	
4.12	65	52	2.6	40	1240.0	1240.0	29	84	
4.22	54	36	1.8	29	582.4	582.4	29	83	
4.32	50	34	1.7	25	450.5	450.5	29	82	
4.42	45	29	1.4	20	324.5	357.0	28	82	
4.52	42	27	1.3	17	234.6	258.0	28		
5.2	39	21	1.0	14	176.1	194.0	28		
5.12	36	21	1.0	11	59.4	66.3	28		
5.22	33	14	0.7	8	28.8	34.5	27		
5.32	30	7	0.3	5	9.0	11.0	27		
						6120			

In the first of the two experiments here recorded, Table VIII., the doors of the fire-place were tightly closed and strips of paper glued over the cracks and joints of the doors to make them air-tight, the base draught damper under the grate being alone left open. The apparatus then formed an ordinary furnace. The air-box was small, and the register throwing the heated air into the room measured but 15×33 cubic meters, or 0.05 square meter, so that the heating surfaces were only partially cooled or utilized. Nevertheless, column 7 shows that enough heat was abstracted by what air was allowed to strike the flues to raise the temperature of 6,415 kilograms of air 1° C. This is equivalent to 1,540 units of heat. A thermometer placed one meter from the fire-place rose (column 9) 59 degrees, showing that a large portion of the radiant heat of the fire passed through the iron doors. The heat saved by contact of air amounted to $\frac{1540}{4600 \times 3} = 14$ per cent of the whole. Adding 3 per cent for that obtained by radiation, we have a total saving of 17 per cent. The temperature of the room (column 8) was raised 4 degrees.

In the second experiment, Table IX., the doors were left open, and the apparatus formed an ordinary open fire-place, with a furnace attached to its smoke-flue above. Column 7 shows that 6,120 kilograms of air could have been raised 1° C., which is equivalent to 1,469 units of heat, or 13 per cent of the whole. A thermometer placed 1 meter from the fire-place rose (column 9) 80 degrees. Adding 6 per cent for direct radiation, we have a total saving of 19 per cent.

The temperature of the room (column 8) was raised 6 degrees. All the conditions were as nearly as possible the same in both experiments. The supply of fresh air brought to bear on the pipes was limited, but the same in both cases. In other experiments made to test the heating power of the apparatus, where double or triple the supply of air was brought in contact with the heating surfaces, and where a proper arrangement of the fresh-air box and registers was provided, the amount of heat saved was two or three times greater than that here effected.

Having found that there is neither theoretical nor practical difficulty on the score of the entrance of cool air through the chimney-throat in the way of our combination, it remains to see what kind of furnace is best adapted for our peculiar purposes.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR THE UNION LEAGUE CLUB-HOUSE, NEW YORK. MESSRS. WEST & ANDERSON, ARCHITECTS, NEW YORK.

The third and fourth stories in this plan, which was voluntarily submitted, are occupied, as in most of the others, by suites of private rooms, — chambers and parlors. The kitchen is in the sixth story; the billiard-room and bowling-alley in the basement.

HOUSE FOR HENRY RUSSELL, ESQ., WASHINGTON PARK, ALBANY, N. Y. MR. WM. M. WOOLLETT, ARCHITECT, ALBANY.

The house is built of red brick and terra-cotta, and finished inside in hard woods.

HOUSE OF W. H. COFFIN, ESQ., COMMONWEALTH AVENUE, BOSTON, MASS. MR. W. P. WENTWORTH, ARCHITECT, BOSTON.

PART OF THE FRONT OF THE WIGGINS BUILDING, CINCINNATI, O., FROM AN ETCHING BY THE ARCHITECT, MR. J. W. McLAUGHLIN.

THE LAST PARIS SALON. II.

Paris.

Although her father is Spanish, Mdlle. A. de Bañuelos, on her mother's side, claims the interest of Americans, and especially of young ladies studying painting, for she shows how possible it is with capacity and purpose — those without these qualities are out of the question — to reconcile art-work with all social duties. Living in a gay circle which would seem to leave little opportunity for work, Mdlle. de Bañuelos, besides three portraits at the Universal Exhibition, has since painted several others, and sends to the Salon a group of two Italian children, life-size, which well deserved the central position given it on the line. American ladies would do well to remember that female artists on the Continent do not find that their talent requires them to live differently from other ladies, and I believe women in America have a feeling that to paint like men they must be emancipated from ordinary female conventionalities. Then is it certain that the wisest aim for women is to paint like men? If women are to paint, why should they forego their special qualities in which they are superior to men? Mme. Le Brun's charming portraits hold their place at the Louvre, not because they look like a man's work, but because they were done by a woman proud of being a woman. Miss Dodson exhibits a life-size Deborah which, I imagine, she will be pleased to hear does not look like "woman's work." It is more masculine than many a man's work, but her decided talent would not be lost in giving us a woman's thought in a woman's words. A contralto need not imitate the ruder timbre of a bass. Both Mr. Healy's portraits and Mr. E. H. May's work are so well-known at the Salon and at home that they call for no special mention. Mr. May has for many years been about the only American who exhibited life-size compositions, but now a new generation has come boldly forward. Mr. S. H. Parker bravely attacks "*la grande pintura*" and so boldly that the battle is half won. His Last Cares to the Body of St. Sebastian is a large canvas, freshly and broadly painted, but hardly sufficiently finished to do him justice, and he will probably work it up more before it reaches America.

Mr. Charles Sprague Pearce, of Boston, in a very large picture of The Sacrifice of Abraham, has made a noble effort (I believe no American has yet exhibited so ambitious a canvas), but he has done far more than this, and the picture has so many good qualities that I believe no one would have been surprised had he been awarded a medal. As it was he received nothing — an alternative which also was not surprising, for to the rigorous the figure of Abraham was weak and without dignity, while in the flying angel he has sought a pose more forcible than graceful. The figure of Isaac, on the other hand, is remarkably painted. The whole tone of the picture is strong and bold, and suggests not unworthily the style of his master, Bonnat. If I have kept for the last Mr. John T. Sargent's portrait of his master, Carolus Duran, it is that I may criticise him, not merely as an American, but as a painter who has already fairly won a place in the foremost rank of young French painters. This portrait of his certainly shared with one by Douce — who very nearly won the Prix de Rome this year — the distinction of being by far the best by any of the younger artists. Without giving Mr.

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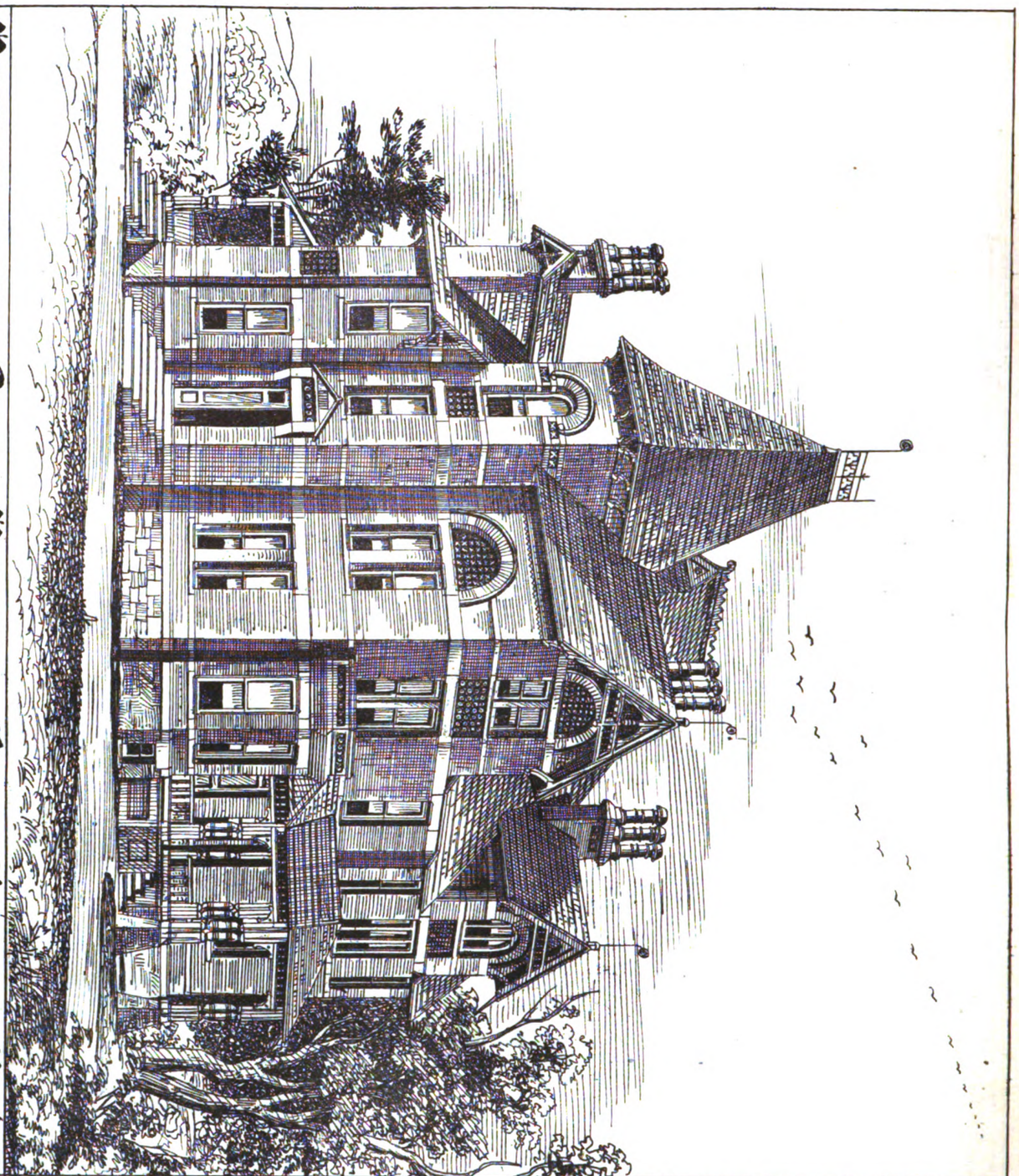
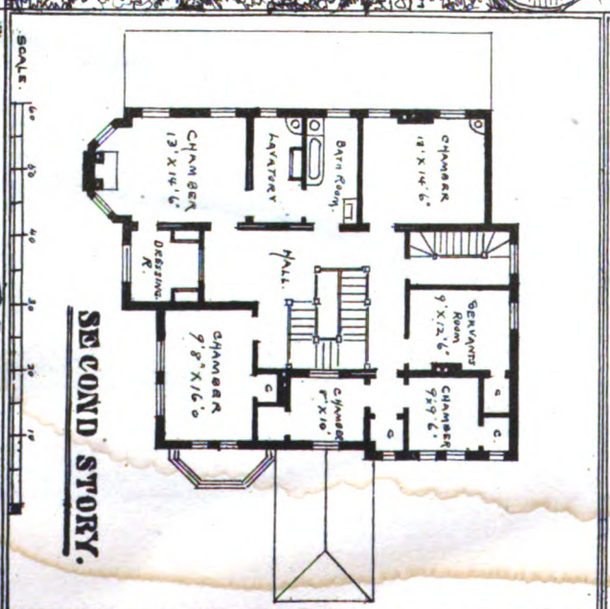
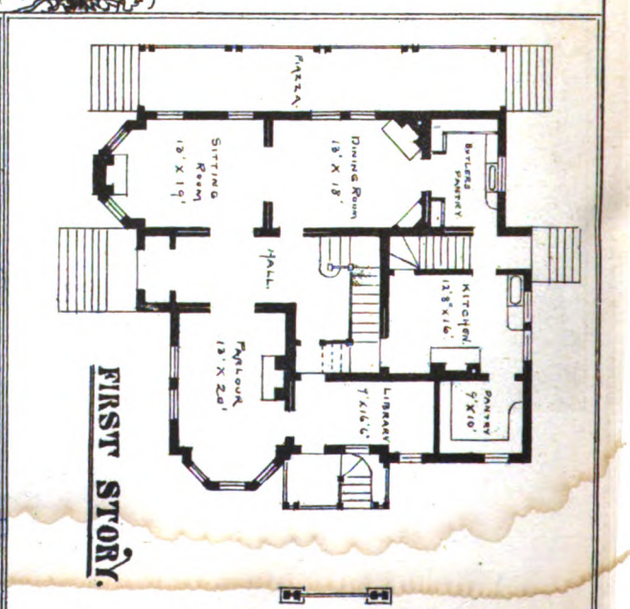
RESIDENCE FOR HENRY RUSSELL ESQ., ALBANY N. Y.







WM. M. WOLLETT. ARCHITECT. ALBANY N. Y.

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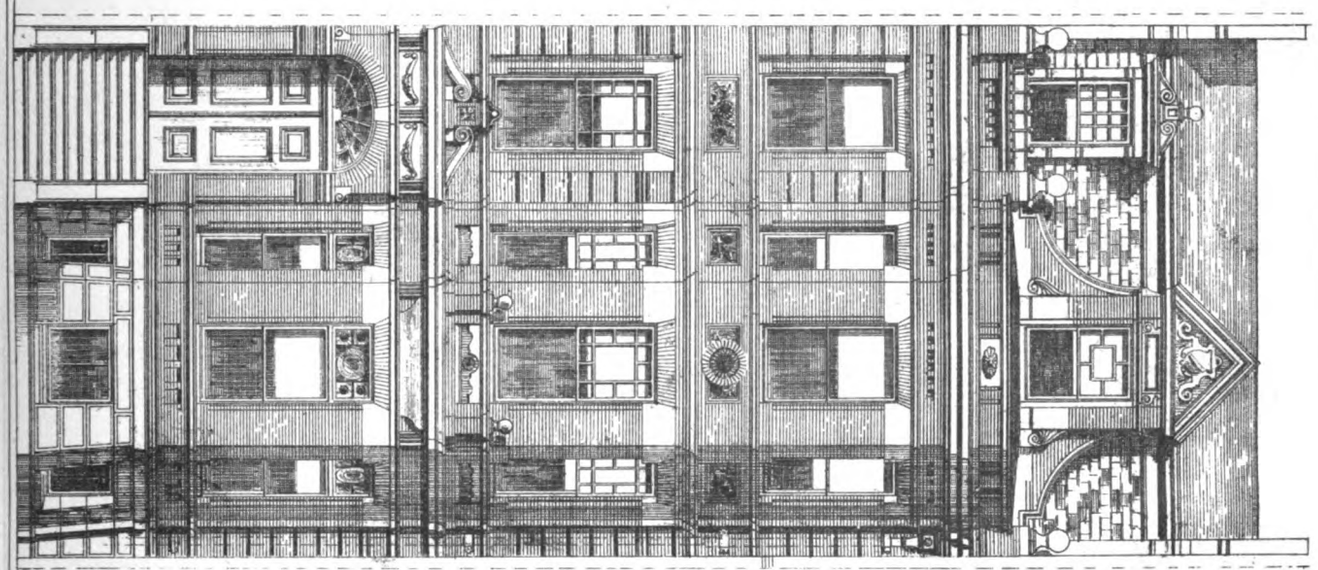
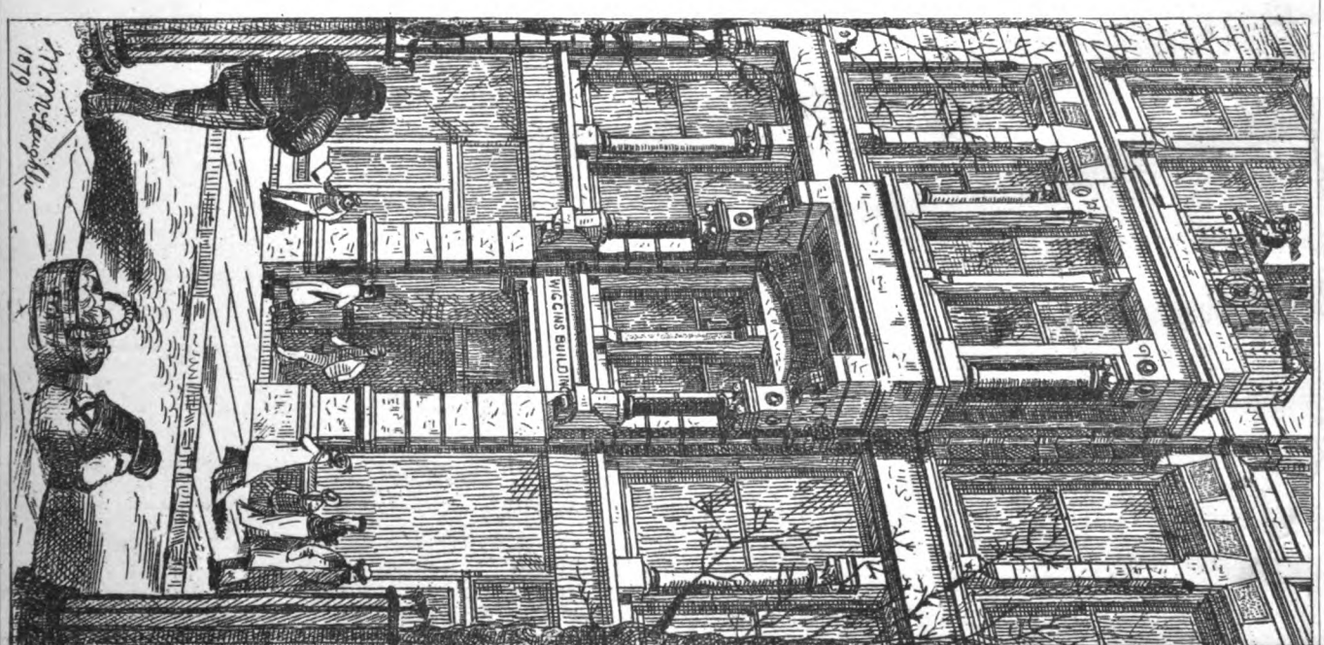


DWELLING HOUSE ON COMMONWEALTH AVE. BOSTON.
FOR U.H. COFFIN.
W.P. WENTWORTH ARCHT.



WIGGINS BUILDING CINCINNATI
J.W. MCLAUGHLIN ARCHT.

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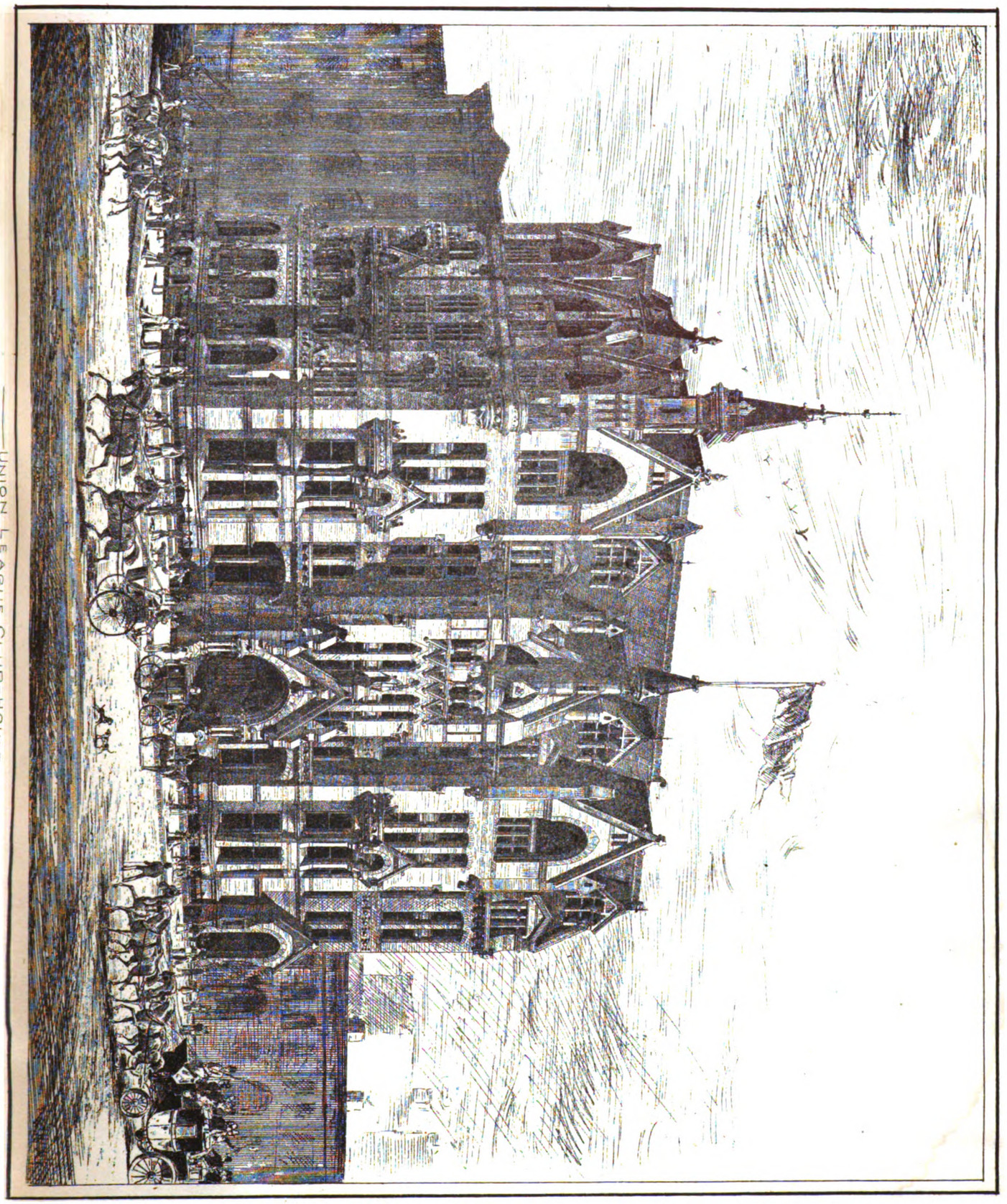

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Sargent too much credit for the admirably spirited pose — it is quite in Duran's temperament himself to take the most becoming pose — one cannot fail to admire his original and masterly scheme of color. It was a happy idea to paint his sitter in a loose morning-jacket, of soft pale yellow, against a cold gray background, but only the highest artistic sensibility would have thought to call out all the subtleties in this gray harmony, and set it vibrating by a single gleam of turquoise blue from the arm of the chair. The interest centres in the pale expressive head, — flattened, Duran's enemies say; a fair and generous expression of the man when at his best and aglow with his noblest thoughts, cry his friends; and a portrait is painted for a man and his friends, not for his enemies. A quite unconscious idealization is a characteristic of Mr. Sargent's talent. Even in his daily atelier studies he manages, without sacrificing their value as studies, to throw over the coarse vulgarity of the model a charm and elegance quite his own. It is a rare gift, this atmosphere of sentiment, which is too distinguished ever to be sentimental. But this would attract little attention from the prosaic French art-world were it not seconded by as distinguished technical qualities. Mr. Sargent, like a true colorist, models, rather than draws, but there is no suggestion of feebleness in drawing, and the only adverse criticism I have heard brought against this much-noticed portrait was a thinness in the painting. This, however, taking in view the rather sketchy scheme of the work, has little weight, and is quite lost sight of in the charm of the wonderful simplicity and freshness of the brush work, qualities which are at present so much the fashion here that many clever painters are sacrificing all else to them. Chief among these is M. Duran, but though Mr. Sargent is his favorite pupil, he has managed to escape his master's exaggerations. This year, however, M. Duran escaped them himself, and the result was so magnificent a portrait that it carried all before it and won the *médaille d'honneur*. In this full-length portrait of a lady there is none of the crudity or vulgarity which has generally marred the artist's former works. The lady is thoroughly *grande dame*, as she stands holding back her fur mantle from the white satin dress, bestrewn with pearls, such as Velasquez loved to paint, and which he would have been proud, if not jealous, to see thus painted by one of his pupils. If not jealous, I say, for I believe a hundred years from now this portrait, so similar in *technique*, will be fairly compared with the best of Velasquez. Lefebvre has a noble picture of Diana and her Nymphs, which, before the Salon opened, it was thought would win for him the *médaille d'honneur* to which he is entitled by his many fine pictures, but Duran's portrait was such a rare *chef d'œuvre* that it carried the jury with it. Of other painters best known in America, Bouguereau has a large Birth of Venus, a hackneyed subject and composition which it required all his refinement of color and drawing to lift from the commonplace. Bonnat has a grand portrait of Victor Hugo, whose strong, deep-furrowed face gives better scope to his powerful, rugged brush than the delicate features of the young Boston lady on his second canvas. Couture, who died during the year, was represented — certainly against his will, as he refused sternly, during his later years, to exhibit at the Salon — by a life-size Pipe Player, which was a double injustice to the brilliant painter, as it was only painted to explain something to his pupils, and over a previous figure whose red robe has worked through and discolored the later work with a brick-like tone. Jules Breton has nothing of interest, and the same may be said of Cabanel and several other well-known men. Before closing, I must note the scarcity of landscapes from our countrymen, who are supposed to excel in that branch. Mr. W. P. W. Dana, whose grand Wave bore off a medal at the Universal Exhibition, has nothing this year of equal power. Mr. Bunce, of Hartford, has a Venetian scene, good in color, but suggesting atelier fancies, rather than Venetian facts. On the whole, the Americans have made, this year, a notable advance in the Salon, and as they all show pluck and energy, they should show a like progress yearly. R.

TECHNICAL EDUCATION IN RUSSIA.

ONE of the principal establishments for technical education in Russia is the industrial school of the Czarevitch Nicolas, at St. Petersburg. This school, which bears the name of the late heir to the throne of the Russias, the Grand Duke Nicolas Alexandrovitch, is an establishment of a character which has not found much favor in our own country, combining general education with instruction in everything connected with scientific and manual industries. It originated in the benevolence of private individuals, who founded first an asylum for poor children destined to become artisans. The society obtained royal authority to open other similar establishments, and it has founded an industrial school for girls on the same principles as the preceding. The society and its foundations are placed under the patronage of the present heir to the throne of the Czar, the Grand Duke Alexander Alexandrovitch, who subscribes three thousand roubles annually towards its funds. The idea of the establishment of such a school in the capital of the kingdom was taken up very warmly; the members of the society already referred to gave 200,000 roubles for the construction of the building, and the merchants of St. Petersburg and others supplied more than 30,000 roubles. During the construction of the school, which occupied three years, the Municipal Council of the capital made an annual grant of 25,000 roubles, and the Government gave the site for its erection and a sum of 75,000 roubles. The value of the whole, as it stands, is set down at 175,000 roubles. The liberality in the supply of money enabled the architects and organizers of the school to pay special attention to the arrangements, not only for the instruction, but for the health of the pupils; and the lighting, heating, and ventilation of the building are considered eminently satisfactory.

The school was opened in 1875, with the three lower classes only, but the number was soon afterwards raised to five, according to the original scheme. Last year the number of pupils was 240, and that of professors and teachers 24. Twelve of the pupils are maintained at the cost of the Grand Duke, and one at that of the Grand Duchess. The authorities of the city maintain 100 pupils at the cost of 25,000 roubles per annum (£3,400, nearly); and the original society supports 38 other pupils. A few of the others are maintained by the establishment itself or some of its individuals, others by governmental departments, and the rest by their parents and friends, who pay 250 roubles per annum (about £32).

This establishment is capable of receiving 300 pupils, all resident; there are no day scholars. The total expenses of the school, with the full number of scholars, would be 95,000 roubles.

The boys are admitted to the lowest class at the age of 11, those who are older are examined, and may be admitted to either of the three lower classes.

The instruction includes: —

1. Catechism and sacred history, the Russian language, arithmetic, geometry, history, natural history, geography, physics, mechanics, and the technology of woods and metals.

2. Freehand and mechanical drawing, writing, singing, and gymnastics.

3. Trades.

The programme of studies is arranged by a committee composed of the heads of the establishment, and secular representatives of the arts, sciences, and education.

The amount of time devoted to the various studies is fixed as follows: —

The five classes of instruction occupy 69 hours per week, 21 being devoted to the Russian language, 14 to arithmetic, 9 to catechism and sacred history, 8 to geometry, 5 to history, 4 to geography, 5 to writing, and 3 to natural history. In addition to the above, 9 hours are devoted to special instruction in physics and mechanics, 4 hours to the technology of woods and metals, 5 hours to singing, and 6 to gymnastics; making up a total of 89 hours per week.

Besides the above subjects and exercises, drawing, of course, fills a prominent place; to it are devoted 41 hours in each week, by the five classes. After an elementary course, the pupils draw from geometrical solids and plaster casts, and execute special designs for furniture and wood carving. The course of mechanical drawing includes a section specially adapted to iron-workers and mechanicians. The instruction in drawing terminates with working-drawings belonging to the various trades taught in the school.

The industrial instruction is confined to the three upper classes of the school, and ordinarily occupies 20 hours per week, but the two weeks preceding the holidays are exclusively devoted to work in the various ateliers of the school, which include shops for cabinet-making, modelling, turning, wood-carving, fine iron-work, metal turning, soldering, forging, and fitting.

The instruction in the workshop is on a very methodical plan, including the teaching of the elementary data, as well as the special processes of each craft. Correct and precise work, and the proper employment of tools, are the objects in view. Orders are executed in the workshops and ateliers, but no pupil is permitted to execute such work until he shall have passed satisfactorily through all the prescribed courses of study and instruction.

When the pupils have completed their studies, they may remain one or two years longer in the school, to perfect themselves in any one of the crafts, and obtain the title of apprentice-workman; this extra time is devoted exclusively to work.

On quitting the school, each pupil receives a certificate, and those who have passed with great credit through their examinations earn the titles of foremen and assistant-foremen, and obtain assistance to enable them to establish themselves in business, or to complete their industrial education and practice.

The industrial institutes, schools, and museums of St. Petersburg and Moscow made a very remarkable show in the machinery court at the Paris Exhibition last year. The extent of the collection of diagrams, models, and other educational material, and the admirable execution of a large number of tools, machines, and models made by the pupils in these establishments, attracted much attention, the unavoidable inference being that the Russian Government and people are intent on raising the industrial and artistic level of the population as much and as rapidly as science and organization can effect. — *Journal of the Society of Arts.*

THE SIMPLON TUNNEL.

OUR French neighbors, recognizing the vast importance of the proposed Simplon Tunnel to their commerce, have, during the last few months, been in negotiation with the Swiss Government; and a treaty similar to the one which was concluded in 1871 between Germany, Switzerland, and Italy, concerning the St. Gothard Tunnel, will shortly be signed, by which permission will be granted to the French Government to subsidize the Simplon Railway Company to

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the amount of some 48,000,000 francs [$9,600,000]. M. Léon Say, the French Minister of Finance, arrived at Vevey on the 16th inst. to make a personal inspection of the site of the tunnel and of the works which have already been carried out, in order that he may possess full *connaissance de cause* in recommending his government to grant the subsidy in question.

The works alluded to consist of a line of railway, lately completed and opened to traffic, which extends from Lausanne up the Rhone Valley to Brigue, at the foot of the Simplon, — the very spot where it is proposed to pierce the tunnel. On the other side of the mountain, the Italian Government is engaged in constructing, at a cost of 28,000,000 francs [$5,600,000], a line railway which will unite Iselle, at the southern end of the tunnel, with Arona, on the Lake Maggiore, the present northern terminus of the Haute Italie railways. The Simplon Railway Company are now, therefore, about to commence the tunnel which, when terminated, will complete the straight line of railway extending from Paris to Brindisi, via Pontarlier, Lausanne, the Simplon, and Milan, — thus obviating the immense angle described by the Mont Cenis route.

It may be remembered that the proposal to subsidize the Simplon route was already submitted to the French Chambers in 1873, when it was indefinitely postponed without discussion. This want of proper consideration must be attributed to several reasons. In the first place, the resignation of M. Thiers and other political events absorbed men's minds in France at that moment. Secondly, the Compagnie de la Ligne d'Italie, in whose favor the concession had originally been granted, had just failed in an exceedingly discreditable manner, and had been wound up by order of the Swiss Government. Lastly, at that time, when the prospect of completing the St. Gothard Tunnel was apparently hopeless, the Simplon route not only seemed to offer no very special advantages to French commerce, but even appeared in the light of a competitor with the Corniche and Mont Cenis Railways; nor were the Paris-Lyon-Méditerranée Railway Company in favor of the undertaking. Now, however, the aspect of affairs has entirely changed. Since 1874 a new company has been intrusted with the execution of the enterprise, and has given most satisfactory proofs of its activity by the completion of the railway up to the very entrance of the proposed tunnel at Brigue. Colonel Ceresole, formerly President of the Swiss Confederation, is the leading spirit and managing director of this company; and is encouraged in his work by the earnest support of such men as Gambetta, Grévy, Léon Say, and others.

To-day the St. Gothard Tunnel is within 1,000 yards of completion, and much of the traffic which now passes over the Mont Cenis will prefer the shorter and more direct route of the St. Gothard. It is of the greatest importance to French interests that the Simplon Tunnel should be immediately commenced; for not only is France threatened with the danger of losing all her English and Belgian transit traffic, but also with the mortification of seeing all the produce of her wealthy northeastern and eastern provinces pass on to German lines, and go, via Basle, through the St. Gothard Tunnel, — a construction subsidized by the German Government.

The Simplon route, however, will have the power of retaining on French territory the traffic which the St. Gothard would draw away from it; and, as matters now stand, will greatly favor the traffic of French railways, notably those from the northeast, and those extending from Paris to the southeast.

Although the tunnel will be rather longer than that of the Mont Cenis, or of the St. Gothard, it will be constructed and worked under very much more favorable conditions than either of them. The entrances to the St. Gothard and Mont Cenis Tunnels are both situated at a considerable altitude, — the former being at 1,152 metres [3,700 feet], and the latter at 1,560 metres [5,000 feet], above the level of the sea. Consequently, costly zigzag and corkscrew lines of access have been resorted to in order to reach the entrance of the tunnels; and, owing to the very steep gradients, the power of traction required is something enormous.

The Simplon Tunnel, on the other hand, enters the mountain at its very base. The railway extending from Lausanne up the lower part of the Rhone Valley is perfectly straight and without any curves, while the gradient nowhere exceeds ten millimetres (1 in 100). At its exit on the southern side of the mountain, in the Diviera Valley, the gradient is somewhat stronger, — 13 in 100. In fact, when the tunnel is completed, the highest point of the line between Paris and Milan will not be in the Simplon, but between Dijon and Lausanne. Owing to the low level of the tunnel, the line will not suffer from the frequent interruptions which the snow causes in winter on the Mont Cenis and St. Gothard routes.

Competent geologists declare that the granite and rock of the Simplon are less hard and compact, and that the infiltrations are less serious, than those of the St. Gothard and the Mont Cenis. The Rhone at the Swiss end, and the Diviera at the Italian extremity, of the tunnel will provide the hydraulic power necessary for the boring; while, thanks to the temperate climate of the Valais, the works will not be exposed to the risk of being deprived of their motive power during severe winters, as were those of the Mont Cenis and the St. Gothard.

The tunnel will be eighteen and a half kilometres [about eleven miles] in length, as compared with the fifteen kilometres [nine miles] of the St. Gothard, and the twelve kilometres [seven and a half miles] of the Mont Cenis Tunnels, and, as it is estimated that a daily advance will be made of nine to ten metres in the boring, we may look for its completion in seven or even six years' time. Eighty million francs are to be devoted to the undertaking, under the following items: 74,000,000 francs for the tunnel itself, estimated at the rate of 4,000,000 francs per kilometre. This estimate appears somewhat high when compared with that of the St. Gothard, which is being pierced at the rate of 2,500,000 francs per kilometre. One million francs are required for the completion of the roadway in the tunnel, and 5,000,000 francs for the construction of a great international station at Brigue, similar to that at Modane, on the Mont Cenis Railway.

Only a very small portion of this sum, namely, 13,500,000 francs, consists of stock subscriptions, the balance of 66,500,000 francs being granted to the company in the form of the following subsidies: 4,500,000 francs from the Swiss Federal Government; 5,000,000 francs from the Government of the Canton de Vaud; 1,000,000 francs from the Government of the Canton du Valais; 3,000,000 francs from the Governments of the Cantons de Berne, Fribourg, and Geneva; a grant of 5,000,000 francs from the Swiss Occidental Railway Company, which will derive great advantages from the undertaking; and, lastly, 48,000,000 francs, the subsidy about to be granted by France.

But little opposition is expected in the French Chambers to this vote, as the leading statesmen of all parties are thoroughly imbued with the necessity of supporting an enterprise which will be so advantageous to the commerce of France. — *London Times.*

THE IMPORTANCE OF FIRE-PROOF STAIRWAYS.

To the Editor of the American Architect:

Sir, — The stairways of all buildings are places of peculiar danger when any accidents by fire occur, whether serious or slight. The passages and stairways are the great air-courses. Then as flame generates movements of air, and these then increase to active currents, ascending and becoming intensified in violence by every foot of their ascent, it is owing to these circumstances that many buildings, public and private, are constantly being destroyed by conflagrations, a large proportion of which, no doubt, could be saved if the right kind of precaution were employed in advance of the trouble. In Italy and many other parts of Southern Europe a time-honored practice of the architects and builders has been that of introducing slate and flag-stone stairways. This is the wisdom of the past, and it is worthy of our recognition and observance. Whenever slate or any varieties of flag-stone, or other tabular forms of rock materials, are not to be had, good substitutes can be adopted most handily in using the very heaviest metallic fire-proof paints and hydraulic cement washes to coat over thoroughly all combustible surfaces and objects.

The stairways of every structure, whether large or small, become in time the driest and most tinder-like parts of the whole premises. This is ascribable to natural and obvious causes, in the perpetual circulation of the air-currents through passages, halls, and stairways, which rapidly season and dry out all the timbers until they become almost or quite as light and combustible as kindling specially prepared for fires.

All wooden surfaces are found to take kindly every variety of ferruginous, silicious, calcareous, and albuminous coating, whether the covering be thick or thin. Vegetable fibre, especially when dry, and the dryer the better, is a generous absorbent of metallic and earthy substances, when these are properly comminuted by grinding and mixing with the ordinary fluids employed as the vehicles of paints and washes. Silica, lime, clay, and iron are great preservatives of timber, either in-doors or out-doors. They penetrate wood surfaces to considerable depths. Some modern applications of hydraulic cement wash, used in about the consistence of cream, for coating the plank sides of cisterns, and the good effects then noticed in its silicifying and partly, in fact, petrifying the wood, are evidences that show what can be done with the like materials in the interior of buildings, where we see such imminent and constant dangers of fires. A handy experiment to exhibit the indestructibility of wood substances or other combustibles can be performed with the very simplest means, — by soaking or painting them with any of these simple and cheap materials; and then after letting them "take a set," and properly dry out, they can be fully exposed to both fire and water, so as to satisfactorily test and show the results above spoken of. Such tests and trials are useful. The extremely simple ingredients of such paints and washes have a direct tendency to case-harden — permanently preserve both from fire and water — every part of a building. The studding, beams, girders, wall-plates, rafters, lathing, and also the doors, windows, and inside facings, mouldings and decorations, can all be easily served in the same way. It is a prevalent and woful evil of many of our people in all parts of the United States to be entirely too slow in some things, and too fast in some others. We have great need to reform in our styles of building, and in no one particular more important than in the simple and economical methods of perpetuating our structures by looking to the means of protecting them against outbursts of fires.

The ancient adage is true which says that fire and water are good servants, but bad masters. There are numberless instances of great conflagrations in the chief cities of our country which are continually occurring, and in all seasons, those in the long, deep winters of the

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North being the most severe and often the most distressing in the losses of property and sometimes of human lives, and in numbers.

In the destruction of the Southern Hotel, at St. Louis, by fire, in the month of March, 1877, the losses were heavy, — perhaps quite a half million dollars, — and there was also a most appalling destruction of human life, amidst which men and women, wakened from sleep in the dead hours of night, rushed from their beds and sprang out from windows in the fourth and fifth stories of this large structure, of course to meet instant death in the fall. This hotel had immense halls, passage-ways, and one great and beautifully winding staircase, from the ground floor to the attic. It was up this great staircase that the first flames rushed, and they rose faster and faster until they made a column of living fire like that of some vast furnace. The conditions made it — as in all other instances of staircases in hotels, and houses for dwelling or occupancy of any kind — serve the purposes of an immense chimney. With its tremendous upward draught, beginning on the ground floor and receiving an accelerated speed as it rose, from all the passages and galleries of each successive floor for the six or seven stories high, the destruction to life and property was fearfully rapid, and the completeness of the havoc in an hour or two, amidst the most distressing scenes, was most appalling. Let us design our houses and arrange our stairways so that the latter will be made safeguards and preventives of ravaging fires. This can be done. There are various good devices. Perhaps the easiest, cheapest, and quickest of all is the simple one of using heavy fire-proof paints. They are extremely cheap, very durable, easily applied to all kinds of surfaces, and they possess great covering capacity. ††

SLOW-BURNING CONSTRUCTION.

NEW YORK, October, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — There are in Boston over a dozen brewery and other cold-storage houses built of brick and stone, with cement and brick floors resting on heavy iron girders, all very substantial. These houses are three and four stories high, and all the walls of these structures are lined inside with sawdust from nine to fifteen inches in width, or with hair-felt and similar highly combustible materials, which are used as non-conductors or insulators of temperature. In New York city there are over one hundred of these structures, and the New York Building Department and Fire Department have no power to prevent their *inside* arrangement. At the present moment a brewery cold-storage house in the city of Philadelphia is being lined with *sawdust and rosin*, a compound which has recently been patented by an enlightened New York chemist for the purpose of providing a suitable insulating material for the purposes mentioned. Though this has certainly no direct bearing on slow-burning construction, it may answer for a *ratio ad absurdum*.

Respectfully, A. D. E.

PRECAUTIONS vs. INSURANCE.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — As an example of the comparative force of building-acts and self-interest, I beg leave to submit the following statement of facts.

The removal of the sheathing is an essential point in this and other cases, to which owners will submit for the sake of possible profit, but which could not be made a provision of a statute. A single spark, passing behind the sheathing into the lint that had been collecting there for some years, would have destroyed the building.

A rat's nest of oily waste is liable to cause fire behind sheathing, and in badly constructed attics, at any time. The same chance may happen if rats carry off the oily rags often used to clean furniture and wood-work in dwelling-houses and decorative warehouses.

In the summer of 1878 the owners of the Dolphin Mill, of Paterson, N. J., applied for admission to the Factory Mutual Insurance Companies of New England. The mill is occupied for the manufacture of goods from flax and jute, and was found to be well constructed of stone as to the exterior walls.

The interior was expensively sheathed with wood very closely fitted, and the fire apparatus was inadequate. The owners were advised to remove the sheathing, which they did with some unwillingness, but to their utter surprise the concealed spaces were found to contain several tons of the finest lint. A large rotary pump was put in and an adequate service of hydrants, hose, and sprinklers.

The sheathing removed was in part converted into shutters covered with tin, with which one side of the mill was protected, it being exposed to danger from another flax mill forty-five feet distant, and beyond that from the Rogers Locomotive Works.

During the first year of mutual insurance the Rogers Locomotive Works were in part destroyed by fire, which extended to and also destroyed the flax mill forty-five feet from the Dolphin Mill.

The tinned shutters and the force pump so fully protected the Dolphin Mill that no claim for damage was made upon the underwriters. Previous to insuring in the Mutual Companies the Dolphin Mill and its store-houses had been insured in the sum of $127,000 in stock companies, at an annual cost of $4,286.44, but some additional machinery and a heavier stock having been carried, the insurance was increased to $173,500.

The net cost of which, in the mutual companies, has been for one year	$438 73
Actual saving	3,847.71
Had the sum of $173,500 been insured upon the old plan the cost would have been	$5,416.68
Actual cost in Mutuals	438.73
Constructive saving,	$4,977.95

The rules and plans of the Mutuals for the prevention of fire probably saved the mill and a considerable section of the city of Paterson from destruction, and saved the owners nearly $5,000 besides, which more than covers the cost of all the improvements and apparatus required of them as a condition of admission.

A heavy gale was blowing at the time of the fire directly upon the Dolphin Mill, and it served as a barrier by which the fire was prevented from extending to a very combustible district on the other side. E. A.

M. VIOLLET-LE-DUC.

THE great French architect, M. Viollet-le-Duc, who died in his Swiss home at Lausanne last week, was a standing astonishment to the French clergy. Probably no other man amongst his contemporaries had so profound an acquaintance with mediæval art, or such an impassioned feeling for it. This is evident, not only in his scholarly writings, but in his magnificent restorations of the cathedrals of Notre Dame in Paris and of Amiens, and also of that most marvellous piece of work, the Sainte Chapelle, behind the Palace of Justice. He was equally at home in his knowledge and appreciative treatment of the castles of the old French aristocracy, as he has shown at Pierrefonds and at Eu. Nevertheless, M. Viollet-le-Duc was one of the most decided of French anti-clericals, and in his later years an advanced republican. During the Napoleonic Empire he did not trouble himself about politics, and it is to be presumed, from his acceptance of a Commandership of the Legion of Honor from the Emperor's hands, and his participation in the amusements of the Imperial Court at Compiègne, that he must have quieted his conscience with the casuistic axiom that he was an artist first and a republican afterwards. Hence, after the fall of the empire and his fervid announcement of republican convictions, the great architect naturally found himself in much the same position as his collaborateur in the *XIXme Siècle*, M. Edmond About. Dean Close, if we mistake not, once wrote a pamphlet which was very popular with certain Evangelicals, in which he maintained the thesis that the restoration of churches is invariably a first step towards popery. The experience of the most eminent of modern continental church-restorers would seem to convey the very opposite moral. The cardinals and bishops who employed him, and observed his zeal in his work, and his scrupulous piety (in an architectural sense), probably thought him a living instance of the adage, "The nearer the church the further from God." It is worth observing that one of the greatest experts in English ecclesiastical architecture was a Quaker. — *The Echo*.

THE ANDRÉ MONUMENT.

THE memorial shaft erected by Cyrus W. Field, to mark the place where Major John André was executed, October 2, 1780, was placed in position and uncovered at noon yesterday in the old apple orchard on André Hill, near Tappan, in Rockland County in this State. There were no ceremonies whatever on the occasion, and not more than twenty persons were present. The workmen had placed the shaft in position, and as near as possible at the same hour that André was hanged, at noon, the covering boards were removed. Not a word was spoken by any one. The shaft is of Maine granite, and is three and one half feet square and five feet in height. There is no ornamentation, the smooth and glistening surface being relieved only by inscriptions in the most modest lettering. On the side toward the west the longest inscription is carved, as follows: —

Here died, October 2, 1780, Major John André, of the British army; who, entering the American lines on a secret mission to Benedict Arnold for the surrender of West Point, was taken prisoner, tried, and condemned as a spy. His death, though according to the stern code of war, moved even his enemies to pity, and both armies mourned the fate of one so young and so brave. In 1821 his remains were received at Westminster Abbey. A hundred years after his execution this stone was placed above the spot where he lay, by a citizen of the States against which he fought, not to perpetuate the record of strife, but in token of those better feelings which have since united two nations, one in race, in language, and in religion, with the earnest hope that this friendly union will never be broken.

Beneath is the name, —

"Arthur Penrhyn Stanley, Dean of Westminster."

On the south side, the inscription reads as follows: —

"Sunt lacrymæ rerum et mentem mortalia tangunt."
(Virgil, Æneid, l. 462.)

The only other inscription is upon the north side, and is this: —

"He was more unfortunate than criminal;
An accomplished man and a gallant officer."
(George Washington.)

An inscription will be placed on the east side next year, the centennial of the execution.

This André shaft stands on a high elevation, about two and a half miles from the Hudson, and not more than thirty yards from the New Jersey line, overlooking a beautiful country. Mr. Field has bought thirteen acres of land in the immediate vicinity, running to, but not crossing, the New Jersey line. He purposes to convert this property into a park, with two entrances, and carriage-ways leading to a circular drive around the shaft, which will be surrounded by an

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iron railing. It is stated that when completed he will present the property to the citizens of Tappan. Four trees, two English and two American, either oak or elm, will be planted at the cardinal points around the monument.

Some doubts have been raised as to the exact spot where André was buried, but Mr. Field entertains no doubt that he has selected the right place. David D. Brower, John H. Outwater, and John J. Griffith, old residents of Tappan, agree that the spot now marked by the shaft is the exact spot where they saw André's remains exhumed in 1821, when the British Government sent the Duke of York to America to convey them to their resting-place in Westminster Abbey. It has also been questioned whether the remains taken to England were really those of André, but Mr. Field is satisfied also upon this point. He has a letter from Dean Stanley expressing no doubt upon the subject, and discrediting any attempt to raise an issue upon the point. — *New York Tribune.*

NOTES AND CLIPPINGS.

Statue of Josiah Quincy. — A bronze statue of Josiah Quincy, the work of Mr. Thomas Ball, which has been set in front of the City Hall of Boston, was unveiled last week. It stands symmetrically with Greenough's statue of Franklin, which occupies the other side of the small open space before the building. It is a statue of heroic size, which the *Boston Daily Advertiser* describes thus: It is a noble work of art, and most creditable to the sculptor. The figure stands erect, with the weight poised on the right foot, the other foot being slightly advanced. Over the left shoulder is carelessly thrown a cloak, which appears to have slipped from the right shoulder, and the edge, passing beneath the right arm, is gathered up in front and held in the left hand, from which it hangs in heavy, bronze folds, while the right hand falls naturally by the side. This outer garment nearly conceals the lower part of the figure, and gives the opportunity for the classic disposition of drapery which most sculptors consider requisite to the best artistic effect. The disposition of the cloak is, however, such as to leave the outlines of the upper part of the figure clearly expressed beneath a closely fitting coat, buttoned to the lapel, above which protrudes the old-fashioned elaborate frill of the shirt front. The head is turned slightly to the right, and the pose, as a whole, is easy and most dignified and impressive. The countenance is said, by those best qualified to judge, to be an excellent likeness of the original.

Falling Buildings. — A wooden building 60 by 40, on the corner of Central and South Water Streets, Providence, tumbled down about ten o'clock at night. The building was formerly used as a warehouse, but of late it has been used to store low-gears. To judge from the appearance of several other buildings in that vicinity, it would not be unsafe to predict their early fall. Some of these buildings actually sag over from the top a distance of four feet, and are only kept in position by being shored up by posts.

The U. S. Capitol. — The report of Architect Clark, of the Capitol Building, at Washington, shows that use has been made of the recess in making repairs which have long been needed, especially about the Hall of Representatives. Changes have been made in the rooms back of the Speaker's desk, which will allow a much increased quantity of fresh air and light to enter the hall, at the same time furnishing an airy retiring room for members. False door-ways have also been opened, and committee and folding rooms rearranged in a manner to enhance the convenience and health of all concerned. Mr. Clark recommends the removal of the wood portions of the old hall, so that the structure may be completely fire-proof. The electric light apparatus is in a fair way of being perfected, so as to be available next winter. Its use will add greatly to the purity of the air during the all-night sessions.

Chicago Sewage. — Dr. John H. Rauch, Secretary of the State Board of Health, has just returned from a trip over the Illinois and Michigan Canal and the Illinois River, with a view to investigating the effects of Chicago sewage upon the water at different points. He considers this the most serious sanitary problem to be solved in that State. He has secured specimens of the water at about two dozen points, and intends to repeat the trip once a month, and make a thorough investigation of the subject.

Philadelphia Sewerage. — The sewerage system of Philadelphia needs improving. The length of the sewers of the city aggregates 350 miles, connected with which are more than 1,000 miles of soil and waste-pipes, communicating with more than 40,000 dwellings; and the kitchen waste from as many more dwellings finds its way to the sewers by surface drainage, to say nothing of the offal from slaughter-houses and the filth from factories. For all this vast system there is no special provision of ventilation, and for nine miles along the Delaware water front, when the wind is in the proper quarter, the sewer gas is blown at low tide into thousands of houses wherein the plumbing is defective. Consequently all that part of the city is a great place for fevers.

Cleopatra's Needle. — The apparatus for taking down, removing, and placing in position in Central Park, New York, the obelisk which has been presented by Egypt, has been completed at the Phœnix Iron Works, at Trenton, N. J., and shipped for its destination. It consists of two frames, composed of rolled iron beams, plates, channels, etc., to support two bearings, upon which are a pair of trunnions, which will be fastened to the obelisk at the centre of gravity. When placed in position the foundation will be removed from under the obelisk, and the immense monolith, weighing 205 tons, will be swung in a horizontal position, as a cannon lowered to the ground by jack-screws, and placed in a cradle prepared for that purpose. It will then be transported to the seaboard and shipped to New York. There the same apparatus will be used to erect the obelisk in a permanent position. Each of the trunnions weighs seven tons, and workmen have been engaged on them night and day for two months.

Completion of Cologne Cathedral. — The first stone of the Cologne Cathedral was laid August 15, 1248, and it is thought it will be completed in another year. The two towers have now reached their last stage, and have only to be fitted with their massive caps of solid stone-work. For this purpose two great scaffoldings have to be erected at a dizzy height; one of them, however, already approaches completion. When the caps have been finished then a still higher story will have to be added to the scaffolding in order to fix on the tops of the caps the gigantic foliated crosses almost thirty feet high, which are to crown the towers. This operation will, it is expected, be performed next spring.

The New Opera-House at Geneva, built out of the legacy left by the late Duke of Brunswick, should now be complete. The exterior has been finished for some months, and in the interior the auditorium was ready: all that remained to be done was to furnish the many dressing-rooms and *foyers*. Mr. J. E. Goss, the architect, expected to finish it by the 30th of September, on which day he would hand it over to the Municipality of Geneva. The house is built chiefly on the model of the Grand Opera at Paris. Round the outside are busts of musical composers, Auber, Meyerbeer, Mozart, etc., and in the entrance-hall there are also four fine busts of Molière, Corneille, Goethe, and Schiller, two of which are by M. Topfort, a Genevese sculptor. On the walls of the two grand staircases, and on the ceiling of the grand *foyer*, there are large pictures, painted by MM. Gaud, Milliet, and Furet, which are effective, though not very extraordinary as works of art. Above the entrance-hall is the grand *foyer*, which is divided into three compartments, in each of which there is a magnificent fireplace of Belgian marble. Two of these fireplaces are by M. Doret, and the other by M. Charbonnier. There are three tiers of seats in the auditorium, with sitting-room for 1,350. Round its walls, beneath the cornices of the roof, are portraits of distinguished actresses — Talma, Mars, Rachel, Déjazet, etc. — in the form of cameos. The cost of the building is about $1,000,000 or 5,000,000 francs.

Leaning Towers. — The most remarkable leaning tower in Great Britain is that of Caerphilly Castle, Glamorganshire. Although but between seventy and eighty feet high, it is eleven feet out of the perpendicular. The castle of which the tower forms a part was built about 1221, and the canting of the tower is said to have been caused by an explosion of hot liquid metal used by the occupants of the castle to pour on the heads of their enemies, at a siege which took place in 1326. There are also leaning towers at Bridgenorth Castle, in Shropshire, and at Corfe Castle, in Dorsetshire, both caused by the use of gunpowder during the civil war between King Charles and his Parliament.

Of churches with crooked spires, the most noteworthy is the famous one at Chesterfield in Derbyshire. It leans six feet towards the south, and four feet four inches towards the west, and its height is 230 feet. So peculiar is the distorted appearance of this steeple, that it is said to appear falling towards the spectator from whatever point he approaches it. There are several traditions extant respecting this singular architectural deformity. The subject was, however, fully discussed at a meeting of the Institute of British Architects in January, 1855, and it was ascertained that the oak planks on which the framework of the spire rests are much decayed on one side, which is sufficient to cause the divergence from the perpendicular. The timbers also have the appearance of having been used in a green and unseasoned condition. The action of the sun upon the spire would therefore cause it to become crooked, and this may account for the distortion, without attributing it to design. — *Chambers's Journal.*

The Hermes of Praxiteles. — Herr Adolf Boetticher writes of the statue by Praxiteles, newly discovered at Olympia, of which a cast has just been placed in the Boston Museum of Fine Arts: "To lightness and charm of attitude is joined the masterly beautiful treatment of the body in detail. Just as in its pose it everywhere appears unconstrained and divinely free, there belongs to this body a blooming flesh that seems only nourished by ambrosia, and that has never known the tremor of pain. Far removed from serving simply as a transparent covering for the skeleton and a network of muscles, as in the Lysippo of Apoxymenos, and just as little as a concealment for the finer play of life by a too great fulness and softness, as in the various Antinous statues, this glory of completeness, streamed through with warm blood in all its members, affects us like a blossom fresh with dew which turns to the spring sunbeams with a grand impulse in all its life-veins. That the fresh splendor of this flesh and the shimmering, silken-like surface were created in full consciousness of their effect is taught by a glance at the equally master-like execution of the two garments, the chlamys of the god which in folds of drapery hangs down over the tree trunk, and the finely-woven linen thrown around the tender body of the little one. This material is handled with a realism which we, in view of all our former knowledge of the antique, must call unexampled. The contrast of the heavier garments to the smoothly elastic surface of the body, and the contrast of the textures when together, — which indeed the photograph from the original makes much more apparent than the dead plaster, — is pronounced so clearly and master-like as only in some modern work of the Tantardini school, or much rather, in the equally grand and delightful creations of our realistically ideal master, Reinhold Begas."

Piloty. — It is reported that Herr Piloty is about to resign the position of director of the Academy of Fine Arts at Munich. His resignation has been expected for some time, on account of various reasons, one of the foremost of which is the disfavor with which he is now received at Berlin. At the time of the attempted assassination of Emperor William there were circulated reports of a difficulty between Herr Piloty and the government, apropos of certain disloyal remarks said to have been made by that hot-headed artist. It was expected then that he would either lose his position immediately or be forced to resign in a short time. He has, however, since then held the post sufficiently long to prove that his resignation depends on his own will. Another reason why he should give place to another is that he does not represent the progressive school of painting in Germany.

Mechanics at Eton. — Eton College, England, has established a building of three floors, in which various mechanical appliances are to be erected, so that boys may be taught the practical use of tools.

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THE season having arrived for the annual appropriations, with it has arrived the annual — unpleasantness, shall we say? — between the City Councils of Philadelphia and the Public Buildings Commission. The Commission, as our readers remember, serves under the act of the State Legislature which took the control of the new city building out of the hands of the Councils to vest it in a special commission, and requires them to vote money for the building on the annual requisition of the Commission, — an act which the city has of late striven vigorously to disregard or set aside, but which the courts have enforced against it. The struggle of each of the last two or three years has ended in the Commission having to reduce its requisition, and get along with twenty or twenty-five per cent less than its first demand. Thus two years ago it demanded seven hundred and fifty thousand dollars for the year's expenditures, while the city vindicated its dignity and lightened its taxes by granting only six hundred thousand. Last year the Commission called for a million and a quarter, and got three quarters of a million. This year it has made its requisition, as before, for a million and a quarter, but is again met with obstruction, and is called upon once more to reduce its estimate. It has therefore sent a communication to the Councils, saying that to do the work which it thinks should be done this year, that is, to carry up the fronts of the building to the level of the cornice, and to make the southern half of the building ready for the roof, will require not less than the amount called for. It suggests, however, that by leaving out a large part of the interior work which it was intended to include, and in particular, the communication takes opportunity to say, by omitting to finish the rooms which it has been expected that the Councils would presently occupy while waiting for the rest of the building to be finished, the expenditure may be reduced, as it was last year, to three quarters of a million. This the Commission puts forward as its ultimatum, and in the light of past history we may suppose that to this it will come.

WE mentioned three weeks ago the trouble of Mr. Gendell, an architect and builder of Philadelphia, who, having built himself a porch in which he took pleasure, found that a fellow-builder had surreptitiously made drawings of it, and was copying it in one of his own houses; and who therefore had appealed to court for an injunction against his plunderer. The injunction has been dissolved by the court, the judge ruling, in his opinion, that the essential point in the case was the question whether the plaintiff, who had taken out no copyright, had actually published his design, in which case he was entitled to no protection. Upon this question the court said: "To publish is to divulge, to utter, to make known to the public, that which was before private or unknown. To say that placing or erecting a design or work upon the highway, with an unrestricted view, without notice of any privacy, for a period of three years, was not a publishing of it would be a singular and unwarrantable denial of the legal meaning of such a term. Any free exhibition of a work of art has been determined a publication as well as the printing and circulating of a book. A dedication by the author to public use is not required to make the design public. Any way by which the novelty or design is communicated or made known is a publication."

THIS decision would probably be generally sustained; and although a distinction in intention may be drawn between simply placing a product of invention for the sake of its necessary use when it is impossible to conceal it, and issuing or exhibiting it for the sake of the advantage to be derived from laying it before the public, the publicity being in one case the invariable incident of its use, and in the other case the purpose of the display, this point is fairly met by the remark of the judge that "three years upon the highway must certainly be regarded as an abandonment of any right, else the copyright law, which confers the remedy and the protection that the plaintiff seeks, would become useless." That is, copyright, the only protection known to the law, would be superfluous if the law held the architect to be secure without availing himself of it. There is no question that architects, if they were called upon to choose between keeping their work out of sight and receiving the advantages of publicity with the risk to which they are exposed of being defrauded by copying, would choose the publicity. These appear, in the present condition of jurisprudence, to be the only alternatives open to them, and it is not likely that any other will be provided, — except so far as they may avail themselves of the copyright, which they are not likely ever to do to any great extent. The only other defence to which they can look is in public opinion, and the growth of a common delicacy about appropriating the fruits of other men's labor, which we cannot expect to see advance very rapidly, if it comes at all. There is besides for the cleverer men the consolation, so far as it goes, of knowing that the better worth copying their work is the more difficult it is to copy, and the more flattering will be the difference between the copy and the original.

WE have more than once called attention to the dangers of elevators, and to the certainty that as they are now used a great many serious accidents must from time to time happen to them. An efficient contrivance for diminishing the danger of the worst of these accidents seems to be that of Mr. Ellithorpe, who has hit upon the device of putting an air-cushion at the bottom of the well to check the blow in case the car falls. A tight box is provided at the bottom; into this the falling car plunges, and the air that is compressed beneath forms the cushion which breaks the fall. The principle is familiar, and indeed has been applied to the same use in Gray's safety attachment for elevators. An experiment was safely tried the other day at the Biddle House in Detroit. An elevator car containing seven persons was dropped sixty feet by cutting the rope from which it hung. The car fell with frightful swiftness, but brought up safely at the bottom. A bench, which seems to have been overloaded, broke, but the passengers were unhurt, and a dozen eggs with which heroic hardihood had strewn the bottom of the car escaped unbroken. A previous experiment at the Parker House in Boston had not been so lucky, and showed the danger which is common to inventors of overlooking, while their attention is fixed on the main feature of their invention, the collateral conditions on which its success may depend. The well in the lower story was closed by a door. This with its casement was blown out of the wall by the compressed air, which, escaping, let the car down abruptly enough to shake and bruise the passengers in a way that sent them to their beds, though without permanent injury, we believe. The car and the passengers in this case weighed some four thousand pounds, and fell through a height of about eighty feet. It was certainly a naïve confidence that expected any ordinary door-casing to withstand the shock of this tremendous impact; nor is it quite easy not to smile at the innocence of the passengers, who prepared themselves to meet the worst by seating themselves upon the floor of the car, thus carefully presenting the end of the spinal column to meet the apprehended shock and transmit it directly to the brain. We would remind all our friends who may venture on similar experiments that boys, when they jump from sheds, with a safe and native instinct take pains to light upon their feet, with loosened knees, which break the jar by a natural spring.

A CONVENTION of persons interested in the improvement of the Mississippi and its tributaries has been held at Quincy, Illinois. The President of the convention was directed to appoint an executive committee, who should memorialize Congress and urge legislation for the improvement of the river. Two sets

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of resolutions were laid before it by the committee appointed for that purpose. The majority recommended that the main river and its tributaries be provided for together by establishing a series of reservoirs on the upper waters, which should equalize the flow of wet and dry seasons. They also proposed that cities and inhabitants upon the banks of the rivers should be forbidden to use the water-power created by the improvement of the streams, or to obstruct them by wharves or by throwing rubbish into them, and that a permanent commission of three members from each State that borders on the Mississippi should be appointed to act as conservators. The minority report urged that it was undesirable to spend large sums on the tributaries, but that the recommendations of the convention should be confined to the improvement of the three main rivers, the Mississippi, the Missouri, and the Ohio. The majority report was adopted.

The Trades-Unions of Great Britain have lately held a congress in Edinburgh, in which societies which together numbered more than half a million members were represented. Among these the building trades were most largely represented, the aggregate of the societies which sent delegates being near a hundred thousand. The masons' and the carpenters' societies each counted upwards of thirty-five thousand members, the bricklayers' and plasterers' each about eight thousand, while the largest single association was that of the Amalgamated Engineers, numbering forty-five thousand members. These figures cannot, of course, include more than a considerable fraction of the whole number of British workmen, and it is probable that many societies were unrepresented among them; but they are large enough to show that the workingmen are a great factor in the British community, and that if they were as influential as they are numerous and well organized, their political weight would be formidable. There are not, we suspect, any non-legislative assemblies in Great Britain, and none in the United States except the national conventions of the two great political parties, which stand for such large constituencies, and they indicate a tendency to bring a new class element into politics which is likely to become a very serious difficulty. The speeches made seem, so far as we see them reported, to have been of a more moderate kind than we sometimes hear; there is, fortunately, an influence in public deliberation and a great assembly which tends to moderate the transports of partisan utterance. The subjects which chiefly occupied the congress were, as usual, the benefits of trades-unions, and the means of extending their organizations. Accordingly we find speeches and resolutions in favor of increasing the representation of workingmen in Parliament, of uniting all the trade societies in the kingdom into a Federative Union, and a proposal to carry on "constant correspondence with the labor associations of other countries for the purpose of establishing friendly relations, and by that means to prepare for the holding of an International Labor Congress at the earliest opportunity." In matters of less general scope, we notice resolutions supporting the system of arbitration in trade disputes, against convict labor, and in behalf of coöperative societies, and of making masters responsible for injuries to their men. On this last subject a bill is now before Parliament which proposes to put workmen on the same footing as outside persons in regard to injuries which they may receive in the course of their work, from their fellow-workmen or otherwise.

The following story is told of the late M. Viollet-le-Duc in an obituary notice of him in *La Lanterne*. "During one of his Alpine excursions, he was walking, tied by a rope to the guide, as is usual where glaciers have to be crossed. In traversing one, his foot slipped as he was jumping over a crevasse, and he fell in, but hung suspended by the rope, which was still attached to the waist of the guide. The guide tried to pull him up, but in vain. Then Viollet-le-Duc coolly took out his knife, and without hesitation cut the cord. By chance, he fell upon a small block of ice, which had lodged between the walls of the crevasse, and managed to seat himself upon it. Then he turned to the terrified guide, and said in a calm voice, 'Go now for help, but don't hurry, for fear you might meet with some accident.' The guide departed, and by and by returned with others, and they succeeded in pulling him out. Meanwhile," *La Lanterne* says, "he had pulled out paper and pencil, and was profiting by his exceptional situation to observe new phenomena of congelation." It is a pity that this story could not have appeared in a more trustworthy journal than *La Lanterne*, but we give it for what it is worth.

The enterprising *Sanitary Engineer*, more familiarly known as *The Plumber*, is encouraged by the success and usefulness of its last winter's tenement-house competition to propose to architects a new competition. This time it is a model school-house for which plans are asked, the requirements most insisted on being light, heating, ventilation, and security against fire. Five hundred dollars are offered, to be divided among four premiums for the best designs, the decision being made, as in the last competition, by a jury of experts. The conditions for competitors and the names of the jury are not yet made known.

HYGIENE AND PUBLIC HEALTH.[1] II.

Passing over the excellent little papers which follow Professor Nichol's essay, we come to Part II., on Habitations, which opens with an ambitious treatise, long enough to make a large octavo volume, on "Soil and Water." There is evidence of reading enough and good sense enough on the part of the author to fill even this space profitably; but it is to be regretted that his matter could not have been digested with the help of a more extended experience. Very many illustrations and descriptions are borrowed from the books of Latham, Denton, and Eassie, of appliances and methods of work which are unknown or rejected in this country, and some of the best features of our own practice are passed over. For example, he illustrates Molesworth's "excellent provision" for disconnecting house wastes, which would freeze and burst twenty times over in one of our average winters, and, in the same way, cuts and descriptions are given of Jennings's English latrines, to the exclusion of Mott's New York pattern, which is at least as good; and, strangest of all, while hollow walls are highly recommended for preventing dampness, the "manner of constructing them" is asserted to be "as shown in the illustration," which is copied from Eassie, and represents such a wall tied with Jennings's patent bonding bricks, a kind of building appliance which is used to a very small extent even in England, while in this country it is, and will probably always be, completely unknown. The ordinary methods of hollow wall building, which are in constant use everywhere, the writer seems never to have heard of. So the Germans get the credit (page 407) of "a suggestion which has been made," to prevent the ingress of ground-air into dwellings. This suggestion is, to have a coat of concrete on the surface of the ground, and a wooden basement floor a foot or so above, the space between being connected with a chimney flue. Surely the president of a board of health ought to know enough of the practice of the larger cities to have heard that the Boston building law requires just such a concrete coating, air-space, and flue connection in the greater part of the houses erected in that city.

But it is in the descriptions of plumbing and sanitary appliances that the inexperienced architect or health officer will find himself most disappointed in this paper. Of drain-pipes several English patterns are given, such as the "opercular" and other access pipes, some varieties of combined sewers and subsoil drains, segmental stoneware sewers, etc., none of which, nor anything similar to them, are known in this market, while the Stanford patent joint, the only English device of any importance which has become domiciled in this country, is omitted, and the pipes made of cement concrete, now so widely used, are entirely ignored.

In laying drains, the joints are directed to be "caulked with tarred gasket, and afterward finished with cement or clay in the usual manner." It is to be regretted that any countenance should be given to the miserable practice of jointing with clay. Nothing less than the best fresh Portland cement should be allowed, at least for branch drains. We ourselves do not much approve of gaskets for small pipes. By a little care the pipes can be held in position while the socket is filled with cement, and if this is carefully wiped out with a semi-cylindrical piece of wood, the joint is completely and smoothly made, and there is no fear of subsequent obstruction or leakage from the rotting of the gasket.

The author, although he does not approve of drains under houses, advises, where this is necessary, that they should be of glazed stoneware, with access pipes at intervals, for inspection. This is far inferior to the common practice of American plumbers, to make all drains inside a house of cast-iron with lead joints, hung to the ceiling or to the side walls; and the American mode of access, which consists in the insertion of a V branch once in ten or fifteen feet, with the free end closed by a brass trap screw, is much safer than the best jointed earthen pipe.

The descriptions of the various forms of plumbing apparatus which are or should be used are similarly defective. The author's opinion, in which all experts will agree, is that "very few of the many kinds of water-closets combine all the necessary requirements;" but we get from him little help to the knowledge of those "very few." He describes the well-known defects of the pan-closet, mentioning some of the ventilating attachments which mitigate its offensiveness, but omitting the greatest improvement of all, the enamelling of the re-

[1] *A Treatise on Hygiene and Public Health.* Edited by Albert H. Buck, M.D. Vols. I. and II. New York: William Wood & Co. 1879.

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ceiver. The hopper he considers "cheap," which it certainly is not in use if properly flushed, but the Jennings closet is taken as the type of the better class of apparatus. Unfortunately, the primitive form of Jennings closet is chosen for illustration, with all its imperfections. The defect of the hollow plug overflow is noted, with the remark that this has been "recently" remedied by means of an inverted cup over it, the author apparently not being acquainted with the far better forms of overflow now applied to this closet.

Of traps, various English forms are copied from Eassie, all of them much inferior to the round trap, or ventilated siphon, or Adee's patent lead traps, which our plumbers habitually use, and a particularly bad closet trap is also illustrated, with commendation in Eassie's own words, in which a pipe purporting to ventilate the "pan" (container or basin?) of the closet leaves the trap just inside the sealing water and joins the vent-pipe which connects with the soil-pipe below the water seal, thus opening a clear passage around the trapping water, which might as well be dispensed with altogether.

But if Dr. Ford neglects some good things, he devotes what we think undue attention to some doubtful ones, such as the Rand system of house-drain ventilation, which we cannot but consider as being still in the experimental stage.

Every one knows what this consists in: a wrought-iron pipe, one and a quarter to two inches in diameter, taps the horizontal soil-pipe in the basement, and extends to the kitchen range, where it ends in a cast-iron box having gills inside, and exposed to the fire like the ordinary water-back. From this another pipe, also one and a quarter inch, or larger, for "purified air," ascends to the top of the chimney. "This," says one author, "will insure complete ventilation of the entire house drainage system." That would be important if it could be proved. The advantage of roasting the sewer air in the "cremator," as the inventor calls it, cannot be very great. If the heating kills the "bacteria," it must leave their charred remains, with the products of their combustion, in the air, while sulphuretted hydrogen and hydro-carbon gases would not be changed, and in the present state of uncertainty as to the nature of the deleterious components of sewer vapor, we should say that the risk of leakage into the kitchen cooking-apparatus through joints exposed to such violent alternations of temperature, with an additional possibility of explosion in case the air in the pipe were very highly charged with gas, would counterbalance the advantage gained, so that a different mode of applying the heat used to excite a current, if less economical, would be desirable. That the application of heat of some kind to induce a current is advantageous, seems probable. It is said, with great show of reason, that the mode now commonly used among our best plumbers of setting up a circulation in the drainage system by extending all the waste-pipes to the roof, with another large pipe carried from the roof to the foot of the horizontal soil-pipe, just inside the street trap, to supply air at the bottom of the system, while it would maintain a constant movement in one direction or the other if the pipes were filled with fresh air, is liable to be made inoperative by the gradual accumulation of carbonic acid and other heavy gases in the horizontal pipe, and the lower ends of the vertical ones, which trap the system like so much water, and can with difficulty be removed. This trapping must depend on the activity of the circulation in the inverted air siphon formed by the pipes, but in summer some such action is quite conceivable.

The Rand apparatus, though indicating the practice which may often be desirable, is in its ordinary form plainly inadequate. With the size of extraction pipe which the inventor proposes to use for ordinary dwellings, one and a quarter inch, it is evident that to produce a current in even one four-inch soil-pipe of three feet per second, which cannot be considered excessive, the air must pass through the small pipe at the rate of twenty-three and one half feet per second, or seventeen miles per hour. It is needless to say that no such blast could possibly be made to rush through a small and tortuous pipe sixty to eighty feet long, by any method like the one proposed.

What is the actual rate of flow through the small pipe, as measured by the anemometer, we have been unable to learn, and the inventor very frankly replies to our question by saying that his business is to "sell 'cremators,' not to apply anemometers," but an approximate idea may be gained from the temperature of the air in the pipe, which Dr. Ford informs us is, "with a slow fire, at a distance of four feet from the range, 300° F.; with a hot fire the temperature has risen to 500°." To our mind this is conclusive proof that the movement of the air in the tube is far too slow to be of much service, and it is rather rash in the author to talk about the "suction power of the hot-air box," and the "active circulation" kept up by such feeble means. However, the principle is commendable enough; if the aspiration pipe could be made four inches in diameter for the whole of its length, except the short portions which were connected with the "cremator," the flow would be enormously increased by the comparative elimination of friction, in the same way that a large water-pipe contracted in the middle to a small diameter will convey some four times as much water as a plain pipe of the same diameter as the contracted portion of the larger one.

This four-inch pipe might be made of cast-iron, at little greater expense than the one and a quarter inch wrought-iron; the only difficulty would be to make a satisfactory joint between the large and small pipes. The heating might also be accomplished with less obstruction to the flow than in Mr. Rand's present pattern of "cremator," and the efficiency of the ventilation thereby increased, but the improved current will involve expenditure of fuel, so that the adaptation of the apparatus to house use will probably be a work of time. Meanwhile, it would not have been amiss for Dr. Ford to mention the common mode of aeration of the soil-pipe by an opening at its foot, connected by a second pipe with the outside air, which in the majority of cases is sufficient without further assistance.

There are many interesting quotations and statistics scattered through the paper, part of whose faults are, perhaps, due to the great range of subjects which it is made to cover, and the consequent necessity of sacrificing some of the time which would otherwise have been spent in collecting practical information to the laborious collation of authorities on the multifarious points of theory which it was necessary to refer to.

TANAGRA FIGURINES.[1]

WE mentioned some time ago the good fortune of the Boston Museum of Fine Arts in receiving from Mr. T. G. Appleton the gift of twenty-two of the little terra-cotta statuettes which have lately been found in the Bœotian tombs, and which are known as the Tanagra Figurines. This, which is the only collection of the kind that has ever been brought to our country, has given occasion for a small descriptive volume, of anonymous authorship, published by Houghton, Osgood & Co., and illustrated with heliotypes. These cleverly executed statuettes are, next to Dr. Schliemann's discoveries in the tombs of Mycenæ, the most remarkable and the most provocative of curiosity, as they are the most commonly attractive of the archæological findings of the day.

The Tanagra Figurines are little statuettes in terra-cotta, from six to twelve inches high, mostly single, though occasionally grouped. Some two or three thousand of them have been found during the last half dozen years, and have been distributed among various museums and private collections in Europe, while a very few have been brought to this country. They differ from the clay images found elsewhere, in Sicily, Cyprus, and Mycenæ, for instance, in being at once more advanced in execution and more familiar, or we might say more domestic, in subject. They are for the most part female figures, draped in a variety of what we may suppose to have been the every-day costumes of the people who made them, or of their neighbors. With these are a smaller number of male figures, warriors, slaves, or other every-day subjects, and a number of statuettes of more heroic intention. The costumed figures are or have been painted in lively tints, sometimes enforced with gold, even the hair and flesh being colored, as is shown by many traces of the original pigments, and even by some statuettes in which the whole coloring is tolerably well preserved.

As to what archæological deductions are to be drawn from these remains, and what sequence can be established between them and the analogous images found elsewhere in tombs, scholars are not yet agreed. Some have argued that being found in tombs they must have a religious intention; but the majority have come to reject this theory, and accept them rather as intended simply for ornaments. They seem, in fact, to rank with the Dresden china figures or Paris bronzes of our day, and might fairly be called the *genre* of classic sculpture. The greater part of them seem to be figures from ordinary life, in ordinary costume, representing actions and attitudes familiar rather than heroic or statuesque. The costumes are in the main those to which we are used in more serious classical sculpture and in vase painting, but with a certain every-day air and unheroic adjuncts of dress — fans, mirrors, hats, and the like — which we have not before seen commonly represented. We may also assume that we here see indications of local and provincial habits and dress which we have not been used to find in the more ambitious or more conventional types of classic art to which we have been accustomed. There are among these little figures some which are evidently modelled on the higher statuary of their day, perhaps actual copies or imitations more or less remote of famous works, popularized, as it were, by the clever but carelessly independent treatment of skilled workmen.

Their execution, in fact, is very analogous to what we get from the ordinary Italian or French modeller of the present day. They show facile handling influenced by the example of the better classic sculpture, which appears in the poise of figure and the management of drapery, and in a certain broad effectiveness of treatment. They suggest the productions of knowing craftsmen, guided by the traditions of better sculptors, able to give a certain style and vivacity to their work, but working in haste for a popular market, careless of proportion and of detail, and with a looseness of modelling which sometimes becomes lumpish, or almost shapeless. They are indeed an interesting parallel to the remains of classic mural decoration that have come down to us, and we may naturally imagine that the wall paintings of Pompeii, the trade work of the professional decorators of their time, have something the same relation to the lost works of the great Greek painters that these knowing little statuettes do to the preserved works of Greek sculptors. They may very well have held among the works of art of their day an artistic rank and a popular use analogous to those of the chromos of our generation, with the advantage of coming from an age of far higher artistic attainment than ours.

The figures that we have seen look generally as if they had been

[1] *Tanagra Figurines.* Boston: Houghton, Osgood & Co.; The Riverside Press, Cambridge. 1879.

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cast in rather rough face-moulds and finished with more or less care by hand, — the backs often hardly finished at all, and showing in many cases a square opening into the hollow within the figure. There is sometimes a visible mould-crease around the sides of the cast, which is of a form to free itself easily from the mould, the undercutting (of which there is not much) and the parts that would not *draw*, as the phrase is, showing that they were added by hand. In every way, therefore, like the gold ornaments found in the tombs of Mycenæ, they bear evidence of being the common marketable product of the people who made them, the supply for a large popular demand. In attitude and expression likewise, they affect the cheerful, natural, and familiar character that suits the every-day taste of all people, seeming carefully to avoid the serious and heroic. So that perhaps only a conscientious desire to attach solemnity of purpose to all the works of the classic Greeks, or a theory that everything which by primitive culture people have carried with them to their tombs must have had originally a religious origin, would have induced critics to ascribe a sacred purpose to these relics. Whether they were a production peculiar to the Bœotians, which there is no just reason to assume, we suppose, and how far they represent characteristics of manners and costume which were peculiar to them, will not be shown, if it appears at all, till we have other familiar relics of Greek life to compare with them.

The small octavo which we have before us tells with a pleasant vivacity, though with little method, the most of what is known about the Tanagra figurines, and a good many things beside, containing a variety of facts and speculations, historical or archæological, of a kind that would naturally present themselves to a lively mind as the fruit rather of a miscellaneous classical reading than of special scholarship. Some of the speculations will hardly hold water, we should say, and there are now and then questionable statements of fact, with occasionally a downright slip, — as when the author includes the Jews among the Aryan peoples, or gives the battle of Tanagra the date of 426 B. C., instead of thirty-one years later. The four heliotype plates, containing a dozen or more figures, give as good an idea as can be got of them without seeing the figures themselves. They are not all, however, from those in the Boston collection.

THE ILLUSTRATIONS.

HOUSE OF WILLIAM E. STOWE, ESQ., BELMONT, MASS. MESSRS. HARTWELL & TILDEN, ARCHITECTS, BOSTON.

DESIGN FOR A COUNTRY HOUSE. MR. THOMAS HASTINGS, ARCHITECT, NEW YORK.

DESIGN FOR A SLOW-BURNING COTTON-MILL. BY MR. RICHARD S. ATKINSON, BOSTON.

The accompanying factory plan is submitted as an example of an attempt to give architectural effect strictly subordinated to the conditions of safety or slow-burning construction, utility, strength, and freedom from vibration.

The buildings are planned with reference to the requirements of a cotton factory of 16,000 spindles and about 400 looms. The carding and spinning to be in the three-story structure, the looms in the one-story building adjacent. This arrangement of machinery is the one usually adopted in England, where the saw-tooth roof is commonly used on the weaving sheds in place of the monitor. The latter, however, is much more suitable to our climate.

The buildings would be equally well adapted to various other purposes, subject, of course, to such modifications as the special branch of industry required. For instance, for a woollen-mill. For a paper-mill, the dusting and sorting rooms in the separate buildings in the rear, the Fourdrinier machines in the one-story building, other work in the three-story part. For a machine-shop, the heaviest work in the one-story part. For a large establishment for printing books, the type-setting, binding, etc., in the three-story and the presses in the one-story part. For this purpose the three-story structure would be narrower, and should have monitors on the roof to light the composing room.

For a cotton or woollen mill, the walls should be 16 inches thick for basement and first story, and 12 inches above, hollow or solid, according to the preference of the owners.

In case more space were required for looms, the weave-shed might be widened and not lengthened, as the monitors prove in practice to give ample light and ventilation without regard to the width of the building, and it is desirable to avoid very long lines of shafting.

The proportions of the buildings could of course be changed according to the number of spindles or looms, or the kind and quality of other machinery to be provided for.

The beams of the one-story building should be in two parts, each part 6 by 12, equivalent to single timbers 12 by 12, sustained by piers eight feet apart each way. Basement, 7 feet high in the clear, to contain shafting.

The beams of the three-story structure would be for the first floor the same as above. For the second floor, in two parts each 7 by 14; for the third floor, 6 by 12; for the roof, 6 by 10. Floors of 3-inch plank, with 1¼-inch top floor, mortar or tarred paper between. Roof 3-inch plank, covered with approved material. The cornice to project two feet, the ends of the roof beams forming the brackets. No boxing, as it is useless and dangerous. No gutters.

Posts of oak bored lengthwise with half-inch holes for ventilation near the top and bottom.

Walls to be painted or whitened on the brickwork, no sheathing, casing, furring, ceiling or plastering, or other method to be used in any part of the building behind which fire can be protected from water, under any circumstances.

The stock-houses, picker-house, and other auxiliary buildings, to have concrete floors. The boiler-house to be 24 feet high, of one story if upright boilers are used, two stories if horizontal boilers are used. In the latter case, the second story to be made a fire-proof oven for drying purposes, when such a room is wanted.

It is proposed to use two independent engines, so adjusted that the machinery in each room can be operated without working the shafting in any other room.

The premises to be heated by the exhaust steam from the boilers, carried through overhead pipes hung from the beams in each room, as indicated in the section.

All portions of the building, in which the material worked is in a combustible form, to be protected by the Parmelee Automatic Sprinkler.

Full specifications and working plans would be required suitable to the specific use to which the buildings were to be adapted. They are being prepared for the buildings shown on this plan, with reference to their use for the manufacture of cotton fabrics.

The floor spaces proposed to be used in this building, if constructed for a cotton mill, have been computed substantially in accordance with the following table, assigning to each department one half the space designated therein.

COMPUTATION FOR A COTTON MILL OF 32,000 SPINDLES.

No. 24 Yarn.

	Pounds, about.	Total.	Stock.	Shafting.	Operatives.	Total Weight.	Floor Space.	Average Weight.
6 Lappers.	12,000	72,000	280	13,000	300	85,580	In sep. build'g.	
240 36-inch Cards.	1,600	384,000	4,800	11,920	275	400,995	17,836	23.30
2 Doublers.	180	1,980	40	1,100		3,100		
12 R. W. Heads.	800	9,600		1,100	180	10,880		
21 Drawing.	2,000	42,000	850	1,250	180	44,280	5,184	8.53
36 Roving Frames.	9,000	32,000	2,000	14,500	4,300	344,800	12,836	27.53
90 Spinning Frames, 176 Spindles each.	4,000	360,000	15,340	125,000	1,820	502,160	15,984	31.42
24 Mules, 672 Sps. each.	10,000	240,000	16,000	24,000	2,800	282,800	24,192	11.69
8 Spoolers.	2,600	20, 00	800	5,000	825	27,515	5,184	6.15
6 Warpers.	450	2,700	700	410	500	4,270		
2 Slashers.		4,000	5,240	2,200	480	12,220	5,760	26.66
8 Drawing-in Frames.	60	480	1,400		1,000	3,080		
800 Looms.	800	640,000	128,000	140,000	16,000	924,000	36,864	25.07
		2,029,540	175,880	326,480	28,300	2,560,980	123,568	20.72
	Add for contingencies 20 per cent.					512,052		
						3,072,312		24.86

The greatest concentration of weight is immediately under the slashers, and as the floor reserved around the slashers is used to pile loaded yarn-beams upon, the weight at this point is relatively much more than the figures show.

The motive of this plan has been to indicate the architectural effect that may be permitted, consistent with due regard to economy, safety, strength, and utility.

THE HYPÆTHRAL QUESTION.

Munychia Harbor, September, 1879.

Mr. Editor, — You will allow one reply to Mr. Davidson's attack upon my paper, for his polemic, if accepted, as it naturally may be by readers not familiar with the somewhat unprofessional points involved, would lessen the confidence and interest of many whose esteem I most highly value. The Parthenon, the great temples of Olympia, Pæstum, and Delphi, prominent monuments of Greek Doric architecture, are, with many others, held to have been hypæthral. This, upon the testimony of Vitruvius, whose words are generally directly referred to two of these by the advocates of the theory. By hypæthral I understand, as is always understood in architectural usage, lighted from above through a horizontal opening in roof and ceiling. Only one writer has ever questioned the belief that this was the manner of lighting these buildings, — Dr. Ross, whose most excellent essay is referred to, whose position is defined at the outset of my argument, and from whom I differ fundamentally as concerns the illumination. Since the first assumption of the hypæthron, some hundred years ago, artificial light within the temples has, to my knowledge, — and I believe I am reasonably familiar with the literature of the subject, — not once been maintained. Such being the case I felt a little surprised at some of the statements of the review.

Whether the arguments urged throughout my paper were or were not merely subjective, whether they concerned or did not concern the hypæthral question, I am, at least, positive that my standpoint was neither "adopted" nor "selected" from that of others. I will not here adduce additional literary testimony touching the subject, nor publish some little architectural insight gained from study of the remains, but will follow Mr. Davidson's objections step by step.

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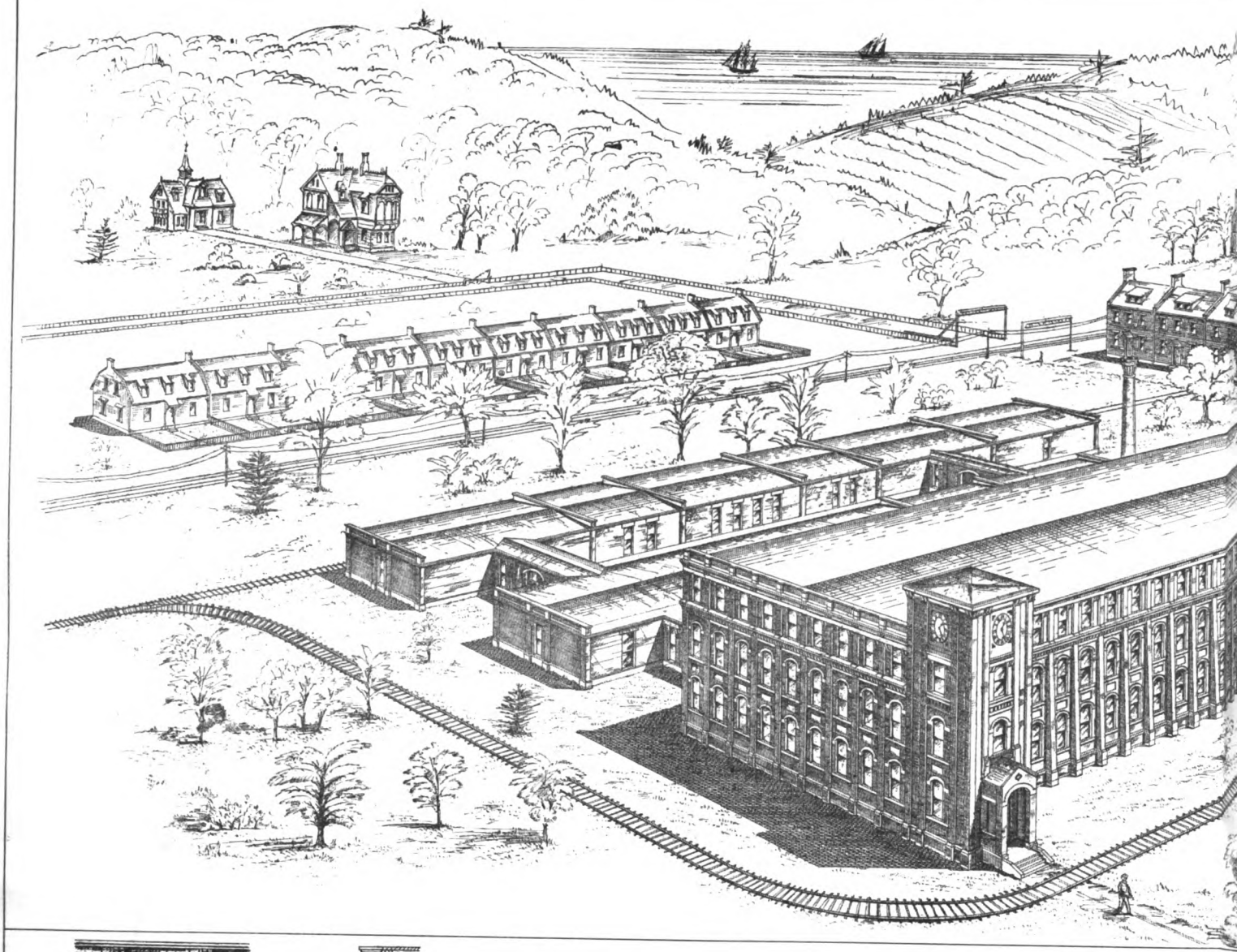

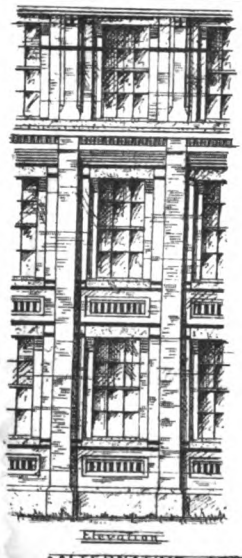

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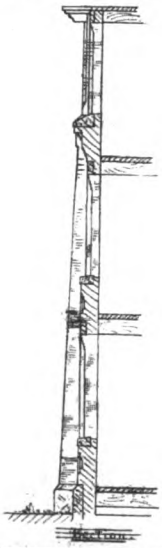

Section

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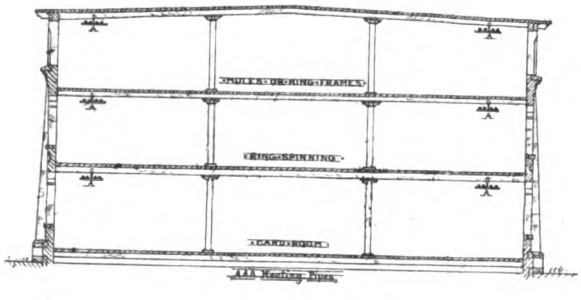

SECTION OF MAIN MILL

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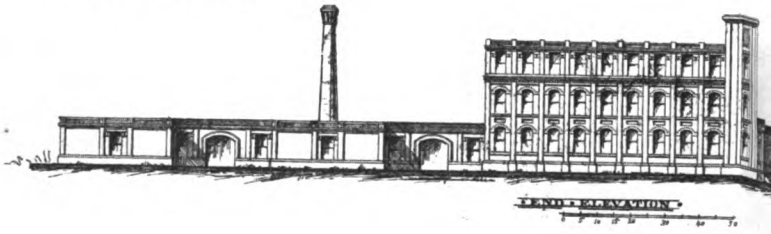

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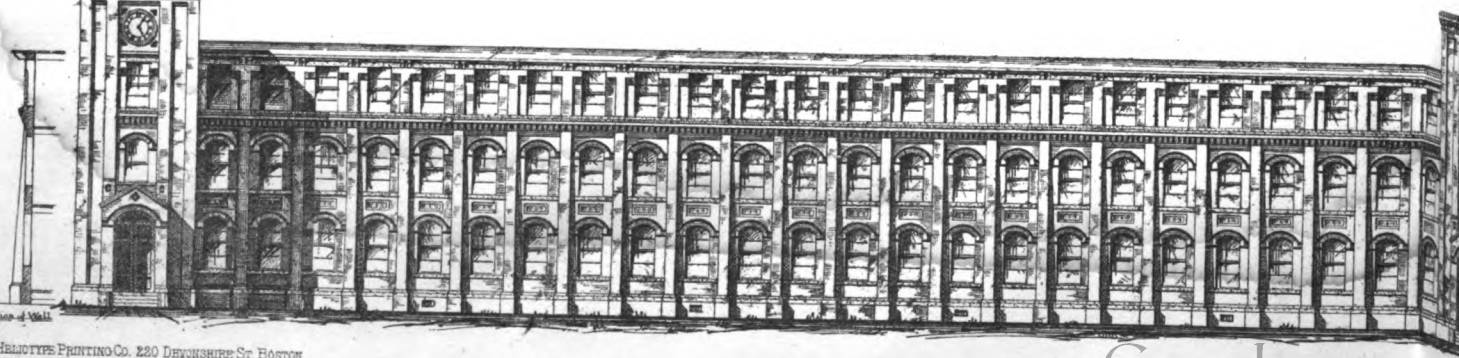

Section of Wall

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

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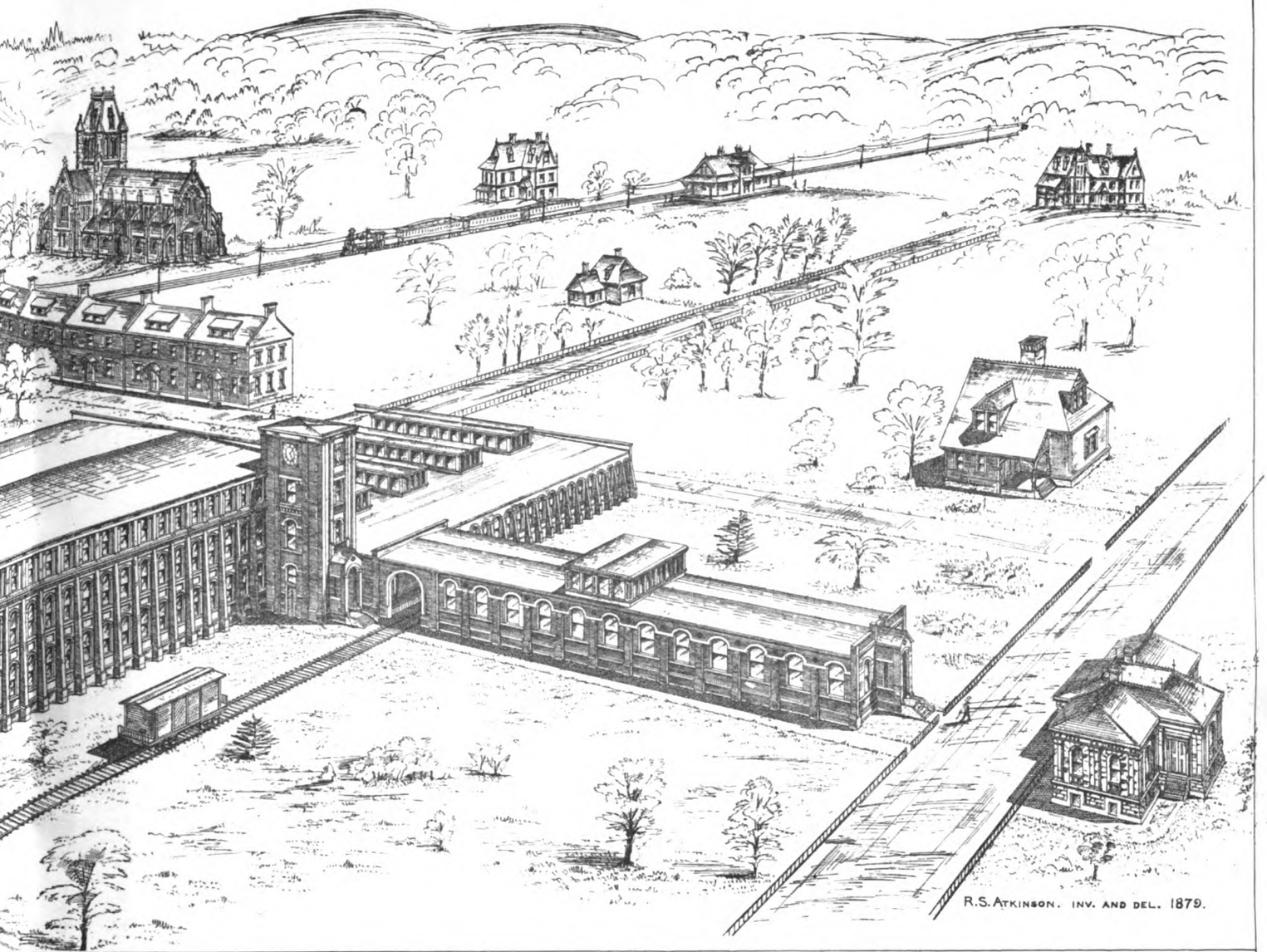

R.S. ATKINSON. INV. AND DEL. 1879.

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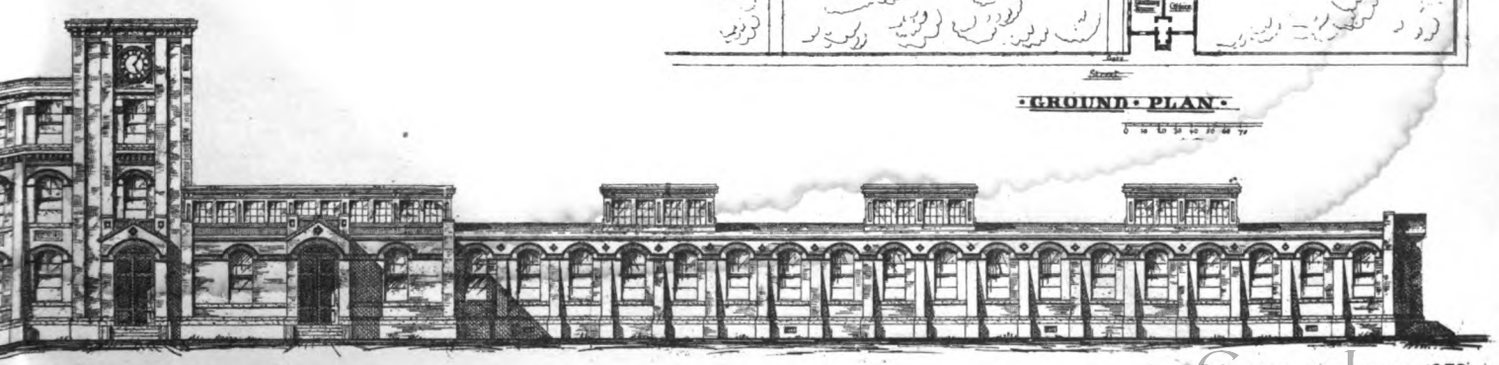

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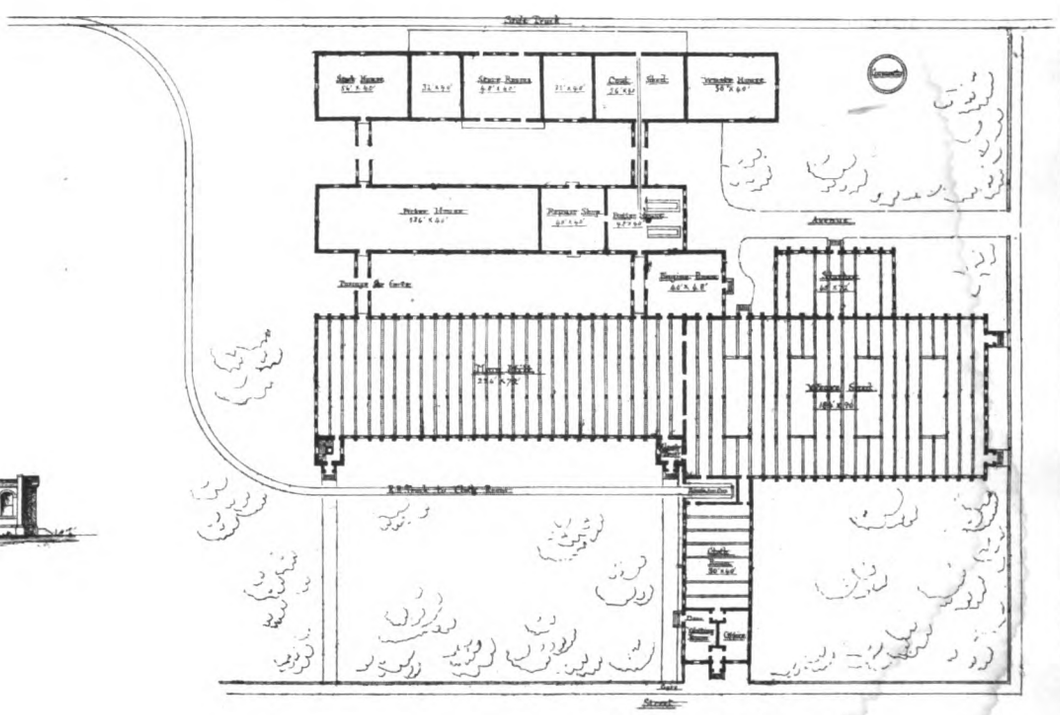

· GROUND · PLAN ·

R.S. ATKINSON. INV. AND DEL. 1879.

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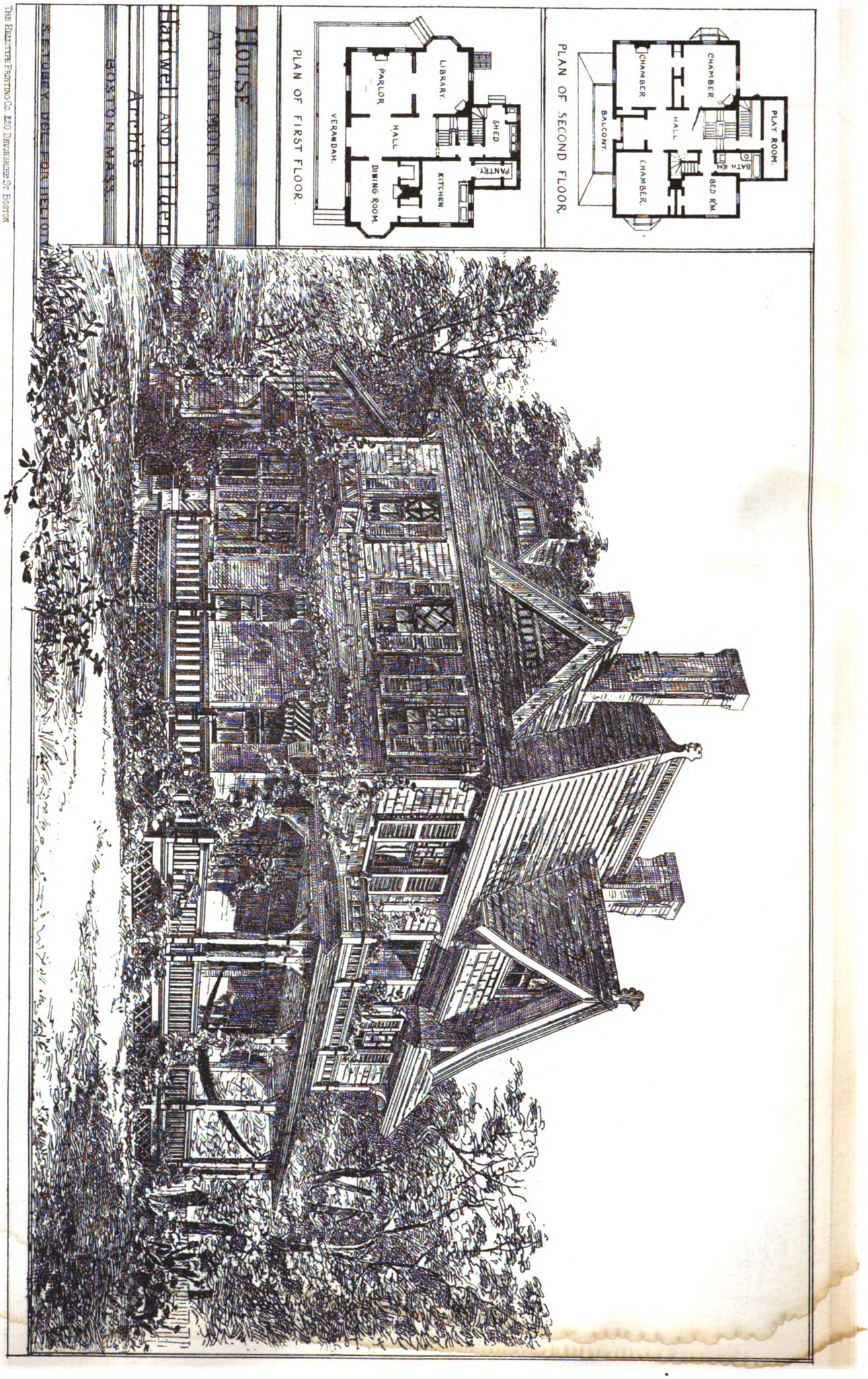

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SKETCHES FOR A COUNTRY HOUSE.

THOS. HASTINGS, DEL.

27 WEST 46TH ST.

NEW YORK.

GROUND PLAN.

INTERIOR VIEW
DINING ROOM FIRE PLACE

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And first to the hinge. Though stated that "it is not true, in any sense, that the passage from Vitruvius is obscure," those self-contradictory lines, at variance with that to which they are made to refer, are still subjected to the interpolations and questionable emendations which they have called forth from so many commentators. To the formidable array of these latter Mr. Davidson is himself now added, he altering the Latin text, notwithstanding that its sense was already to his mind "explicit, clear, and unequivocal," so that it may refer alone to the temple of Olympian Zeus, at Athens.[1] But the example given by Vitruvius has eight columns upon its front, and this temple unfortunately had ten. And here we have an explanation of the unequivocal text which is truly unparalleled among previous attempts to fit the passage to an individual theory. The *octastylos*, the exception to the *decastylos*, which here, as in the foregoing description of the dipteros, refers to the exterior front of the temple, he holds suddenly, and without a word of justification, to apply to the interior, to the columns of the hyperoön, columns which in Greek architecture seldom existed upon either of the "ends," — never upon both. Not a thought is given to the explicit *in pronao et postico*. Moreover, the supposition that the flight of shafts which would be seen within the naos in a transverse section of the temple of Olympian Zeus, in Athens, could have been eight is an impossibility. The number would be six at the most, more probably only four. To consider an hypæthron — that is to say, simply nothing, the open air — as being built into a permanent temple, thus leaving an opening in the roof of the structure when this "ran all the way around it," is, indeed, a curious architectural conjecture. This, I believe, is the only new fact or testimony brought to bear upon the subject by Mr. Davidson. Considering that the degeneration of the styles of Greek architecture, the gradual substitution of formalism for thought, began in the third quarter of the fifth century B. C., and it may be said that Vitruvius, who wrote very near the advent of the Christian era, was about as far from Ictinus as we are from Jeanne d'Arc; that the subordinate Roman government builder had never been in Greece is a conviction gained from the interior evidence of his book, and was advanced as nothing more. If my critic finds the suggestion of the possibility of error in the manuscripts so "very amusing," he certainly has occasion for amusement in the absolute contradictions, the proposed impossibilities, the misstatements of every kind which follow each other from page to page of the ten books. Concerning the statement that the temple of Olympian Zeus, at Athens, was without a roof in the time of Augustus, Mr. Davidson says: "We know nothing whatever about the matter. This is another baseless assumption." Now it so happens that Livy,[2] who saw the temple nearly at the time when Vitruvius wrote, speaks of it as *inchoatum*, as does also the contemporary Velleius Paterculus.[3] Strabo[4] calls it ἡμιτελὲς at this period. And that Vitruvius himself well knew its condition is clearly seen from VII. *praef.*, "*cellæ magnitudinem et columnarum circa dipteron collocationem, epistyliorumque ceterorum et ornamentorum ad symmetriam distributionem*," etc. This is a most exact description of the advance of the building; cella walls, the columns with the entablatures, stood and bore the coffered stone ceiling, *ceterorum ornamentorum* of the pteroma. That is to say, the temple was without a roof, stood, as so many did, for some time without wood-work, the naos was uncovered, *medium autem sub divo est sine tecto*, as our author appears to have expressed it. Why, in this respect, it was not an example of an hypæthral temple in the literal sense of these words, will not be easily explained. That Mr. Davidson should take the passage to refer to this incomplete building is a gratifying support of my assumption, which the retranslation of the text into Greek only strengthens. To conclude this consideration of the Roman writer's testimony I would remark that the two other passages in which the word *hypæthrus* or its derivatives are employed[5] also do not refer to any half-roofed scuttles or to any structure whatever, but mean simply and only out-of-doors, not under roof at all. Why then should I "venture to dispute" the first of these, the well-known fact that the Roman gods of the sky, lightning Jupiter, Sun, Moon, and Heaven, were conventionally worshipped in the open air? No more need be said concerning the passages from Justin and Strabo than was in my paper, to which I would refer for much Mr. Davidson has overlooked or ignored. He states, "we have no proof that there were galleries in any Greek temple save one, and existing remains rather discourage than countenance the notion of their having been at all common." Now to speak of Doric temples alone, there is direct literary evidence to the existence of the hyperoön in the Delphian[6] as well as the Olympian[7] temples. It actually is to be seen and measured in Pæstum, and he who can study so many of the Sicilian temples, and can attempt to picture to himself the antique arrangement of the Parthenon interior, without becoming aware of the galleries, must advance to the question with prejudice or with insufficient architectural understanding. It is not a weighty argument against those in the Parthenon, that "they are not mentioned by Pausanias," who says not a word concerning the building itself, and disposes of the gable groups, the chryselephantine statue, and all the other wonders, in three or four short sentences.[8]

[1] For the text, fixed with diplomatic precision, compare K. F. Hermann, *Einladungschrift*, Göttingen, 1844, and Boetticher, op. cit. No manuscript gives *est* for *et*.
[2] Livius, xiv. 20.
[3] V. Paterc. i. 10.
[4] Strabo, ix. 396.
[5] Vitr. i. 2, and v. 9.
[6] Pindar in Paus. x. 5.
[7] Paus. v. 11.

The illustration of the Acropolis, published in the German *Mittheilungen*, is one of those to which I especially referred. Of all contemporary views it alone shows the manner in which the steepness of the roof was increased. (Compare page 31.) If "it is true that what little evidence we have goes against the notion of an hypæthron," an admission, certainly, how can it "yet be in favor of lighting from above"? If "no doubt, the Parthenon was covered with the original tiles," covered completely, as we know from Tavernier, I cannot see why "this fact has no bearing upon the lighting of Greek temples." But it is grievous to see that so long, and, as I hoped, so clear an explanation of the origin of the peculiar opening in the Pantheon dome has been in vain. As for "the small, very old temple, possibly of Hera, near Karystos," there are many good reasons to exclude it from the argument. The best authorities[9] conclude that it was naught else than a goat-house. Nothing characterizes the hut as a temple. Whether the gap between the projecting blocks which partly cover it was intentional, and thus to remain, is doubtful. Apart from all this the fane, if such it was, could only be considered with the open metopes of the pre-historical period, Doric cellas which existed before the introduction of the Egyptian peripteros and the hieratic changes which this form involved in the earliest ages of Greek architectural history. My paper was but the single chapter of a projected work, and a consideration of these points would not there have been in place. They were omitted neither from ignorance nor from neglect. To the right "facts steadily to be borne in mind to ease future discussions," the following remarks may be offered. 1. The two examples given by Vitruvius were in Greece. There never was an octastyle Corinthian temple in Athens. The famous passage must then, after all, have bearing upon the lighting of Doric and Ionic, or, as it is elsewhere stated, of the larger Greek temples. 2. If the buildings are not assumed to have been either unfinished or dismantled, this second "fact" is an unqualified reassertion of the hypæthral theory, and as no proofs are adduced can only be denied.[10] 3. The supposition that Greek constructors "who could rear a Parthenon" were unable to roof temples like those of Zeus, at Ilium and Athens, by means of a trussed roof which could have bearings upon cella walls, and hyperoön columns, need not be discussed before architects. This Athenian temple, with a maximum span of 14 metres, stood opposite the vast cedar roof of the Odeon of Regilla, which had a clear span of 72 metres between the walls, over 240 feet, five times that offered by the temple. 4. The Telesterion of Eleusis was not a temple, but a house of assemblage. Enclosing thirty-five times the area of such temples as the so-called Theseion or that of Ægina, the extent would compare favorably with our largest halls and churches. For such a building natural light is necessitated by its destination. (Compare the standpoint of my paper, page 27.) It was a basilica, was completed story by story. Plutarch says "Xenokles of Cholarge crowned [that is, finished] the clerestory upon the palace-like hall."[11] 5. To satisfy a curious religious conception, for an understanding of which I quote below two passages,[12] several tiles were removed from the slanting side, *prona pars tecti*, of the roof of the temple of Jupiter Capitolinus, at Rome, thus giving the appearance that its continuity was perforated, *perforatum tectum*, by a diminutive *exiguum*, hole; and causing the remarks of the five authors who mention it, and who, fortunately definite, use these terms as something queer. That this has no bearing upon the question otherwise, perhaps, than as demonstrating that the roof was not cut into by an hypæthron, is evident; and it is not necessary to apply to it the unequivocal statement of Vitruvius, then certainly speaking of that with which he was well acquainted, that no hypæthral, no roofless temples stood in flourishing and well-repaired Augustan Rome. 6. The question of ventilating a lamp-lit naos is far from a difficult one. But, were it absolutely impossible, the almost imperceptible smoke of naptha flames would hardly have done as much damage to chryselephantine statues, to thin plates of ivory secured by isinglass to a core of many-jointed pieces of wood, as an occasional shower of rain. Though "ancient wall paintings were almost weather-proof," ancient silk tapestries, ancient

[8] Paus. i. 24.
[9] K. F. Hermann, *Ztschr. f. Alterth.* 1849, 19, and L. Ross, *Griech. Königsreisen*, ii., p. 31.
[10] Pausanias uses the words οὐκ ἔχων ὄροφον (to Mr. Davidson "seemingly his expression for 'hypæthral,'" though often given οὐκ ἔχων ἔτι ὄροφον, effectually precluding such an understanding), as well as the synonymous ἔχων οὐτε ὄροφον, for temples uncompleted, with roofs fallen in from disrepair or fire, and dedicated not alone to Zeus or Metros Theos, but to Apollo, Athene, Aphrodite, etc. Compare i. 1, ii. 12, viii 41, iii. 21, ii. 36, iii. 22, ii. 18, and many more. The last "neither states that the roof was destroyed or decayed," and was not dedicated to Zeus, but to Demeter.
[11] This is the exact architectural sense of τὸ δ' ὀπαῖον ἐπὶ τοῦ ἀνακτόρου Ξενοκλῆς ὁ Χολαργεὺς ἐκορύφωσε. It is plain that a mere opening, an hypæthron, could neither be *built up* (κορυφόω), nor placed upon (ἐπὶ) the hall. Hesychius defines ὀπαία = θυρὶς, window or doorway, a vertical opening; ὀπαῖος is that which is therewith provided. This is made still clearer by the verb, which is derived from κόρυς, helmet. In English we call such a superposed clerestory as was upon the Eleusinian hall a "lantern;" other languages still term it a "helmet." Both these technical expressions are figurative; the building was, indeed, helmeted by the small upper story. I sincerely regret having to publish this apart from its connection and illustrations, apart from much that explains and supports it.

[12] "Quid, nova cum fierent Capitolia? nempe deorum
Cuncta Iovi cessit turba, locumque dedit.
Terminus, ut veteres memorant, inventus in aede
Restit, et magno cum Iove templa tenet.
Nunc quoque, se supra ne quid nisi sidera cernat,
Exiguum templi tecta foramen habent."
Ovid, *Fastorum*, ii. 667, 673.

Again: —

"Unde in Capitolio prona pars tecti patet, quae lapidem ipsum Terminum spectat; nam Termino nonnisi sub divo sacrificabatur." (Servius ad Aen. ix. 448.)

This is certainly clear. Terminus was found in the temple, would not give up his place, and must see the sky.

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musical instruments, ancient inlaid shrines, and all the manifold contents of the naos hardly were.[1] 7. If "the presence of burning lamps in temples does not prove that they were used for illumination," we may at least feel reasonably safe in assuming that they illuminated. 8. For the opening and closing of an hypæthral orifice in the Parthenon we will say, for instance, some 7 by 17 metres, or 23 by 57 feet, I would refer to page 16 of my paper, allowing full play for the reader's imagination to picture the means. 9. The eternal principles of constructive truth and rhythmic beauty, "æsthetic notions" to Mr. Davidson, are not of to-day nor yesterday, but are and ever will be the same as when so eloquently expressed in the architecture of Greece, twenty-four centuries ago. 10. The arrangement of the Erechtheion cannot be here discussed. I hasten and will only refer to the almost endless literature upon the subject. In the Pandrosion, where Mr. Davidson supposes the olive-tree to have stood, the usual western portico is omitted, and we see three large windows, the only ones among the remains of Greek hieratic architecture. The Erechtheion was thus hardly "a building from which the sun was excluded."

In conclusion, I humbly acknowledge the misapplication of my note "uppermost ceiling" to the passage of Strabo, and the misprint ὑπαίθρα for ὕπαιθρα. I appreciate the delicacy which published the former as "a worse than school-boy blunder."[2] Perhaps these two oversights, for they are in reality no more, and have long ago been corrected in my manuscript, may be forgiven me. I am unwilling to enter into controversy with an adversary whose spirit and aim I conceive to be other than my own, and definitely close the argument upon my side with this rudimentary consideration of the charges he has brought against the subject, none of which have been ignored.

Most truly yours,

Joseph Thacher Clarke.

CORRESPONDENCE.

[From an Occasional Correspondent.]

THE PARIS INDUSTRIAL EXHIBITION.

Paris, October 1, 1879.

Last month a competition was held to obtain designs for a series of ten stained-glass windows to be placed in the Cathedral of Orleans, illustrating the story of Joan of Arc. The drawings were exhibited at the École des Beaux-Arts. Eleven thousand five hundred francs were given in prizes. The jury awarded the first prize of four thousand francs and the execution of the work to Lorin of Chartres. It was interesting to notice the amount of provincial talent represented, only five designs having been offered by Paris firms, whereas the provinces sent eight, one taking the first prize and four others taking prizes to the value of three thousand five hundred francs together. Most of the designs were very carefully studied, and especially in the first two showed a nice appreciation of the requirements of stained-glass decoration as used in church architecture, breadth and quietness of tone being carefully preserved, even in representing such stormy scenes as the capture of the Maid of Orleans by the English, while nothing like pictorial effect was sought for. But two of the windows were required to be indicated in color. The uncolored designs belonging to the first set were executed in pencil on greenish-brown paper, slightly touched up with white, and were very well indicated, little shading being used, but every pencil stroke being made to count.

The Annual Industrial Exhibition has been for some time in progress in the Palais de l'Industrie. It claims to be an international affair, but with a few exceptions the exhibitors are Frenchmen, Parisians. It has as much the air of a grand bazaar as an exhibition. Everything is for sale, and one can buy a cog-wheel or a diamond ring, a glass of soda or a pair of boots; but although there is so much that is commonplace, there are many individual exhibitions that are quite interesting and well worth study from an artistic point of view. And by opposition the display of safes might be mentioned as presenting very poor work in design. It might be supposed that the French, who as a rule succeed so well in giving character to their work, would have something really excellent to show in this respect; but the safes exhibited are either bare iron boxes, or else imitations of articles of furniture, adorned with colonnettes, fanciful frieze bands, painted ornaments, etc. There is nothing about the best of them to suggest the idea of security from fire and thieves.

But in handling of faïence the French show a great deal of taste. Ch. Poyard has a very interesting exhibit in this line which contains some absolute gems of ceramic art, not showing, perhaps, the classic beauty of Sèvres ware, but bolder in design and in the use of color. Particularly noticeable is a pair of exquisite vases purchased by Prince Leopold. The general design is in the Persian spirit. The colors are light blue and white combined in a net-work of interlacing ornaments, Indian figs and conventional plant-forms running over the body of the vase, while on the edges of the handles and down each side are vivid streaks of deep blue, enforcing and giving a pronounced character to the whole design. The effect is charming. Royalty has made several purchases in this exhibit. Queen Victoria, the Princess Louise, and the Princess Beatrix have their names attached to smaller vases of no less beautiful design. Another striking piece is a large circular platter. The ground is a very deep strong yellow, upon which is represented a quaint Japanese figure in a strong purple robe, with just a few touches of gold, forming a very rich, complete harmony in color.

Leon Pavillée exhibits some very fair faïence for architectural decoration, including those exhibited last year at the Champ de Mars. Most of his work is Moresque in style, and is very well handled; still it seems a question whether such strong colors and exuberant ornamentation would be appropriate for anything but a palace for a world's fair, like that of last year.

Among some cloisonné ware exhibited is one large plate upon which is produced a strikingly beautiful effect with but few colors and a simple design. It represents a swallow flying over the sea. The sky is a mottled gold. The water is a deep blue, with lines of gold indicating the wave crests. The bird is blue, with bits of black and white and brown. The whole effect is exquisite. And in an adjoining exhibit is an even more remarkable example of charming effect with simple means, — a vase of elegant outline, colored a very light blue and enforced by patches of a rich brown sepia, the two colors being separated by narrow threads of yellow. Again, a few steps farther, a very elegant effect is produced on a vase, the body of which is of a delicate ash color, with light running ornaments in pale blue, set off at top and bottom by rich browns, with just a trifle of yellow. In the same exhibit with this last are several fine pieces which have been purchased by the *Musée des Arts décoratifs*.

There is a very good exhibit of Bohemian glass-ware. In one quite prominent set a good result is obtained by uniting clear and colored glass, the red glass being used as panels around the sides of the ware, while the whole piece is covered with a pretty net-work of gold plant-forms. Bohemian ware seems easily to take to itself a chaste, fresh appearance that is very engaging. This shows itself in another set in the same exhibit made with iridescent glass, the ornamentation being in fine lines of black.

With a few exceptions the furniture exhibits are not very interesting, most of them showing but little variety in arrangement or excellence in design. One firm alone, Fleck Frères, shows anything more than a mere assemblage of individual pieces. This establishment exposes a very neat arrangement for a bedroom, including hangings, carpet, etc. The furniture consists of bed, dressing-case with mirror, *chiffonnière*, two chairs, and table, the cost being three thousand three hundred francs. The set has been sold twice, as the exhibitor takes pains to announce. It is made of a very black wood, possibly ebony, enriched with graceful, delicate carvings and ornamented with beautiful paintings on plaques of enamel set into the wood. These enamels make a difference of cost for the bed alone of three hundred francs. They fit very nicely into the general design, producing an exquisite effect by their clear tones and bright colors, in contrast with the plain black of the wood. The hangings and the upholstery are of a very pale blue, edged with maroon, and the carpet is of an undecided drab or ash color, with a delicate flower pattern. The mantel and fire-place are of a light rose-colored variegated marble, with gilded fire-screen, andirons, etc. In the same lot, though not included in the price above named, are several pieces, adding considerably to the attractive appearance of the whole, — a graceful flower-stand by the window, a very neat *liseuse* with marble top and convenient little shelves below, and a working-table with a pretty faïence plaque set in the top.

The principal stairway by the north entrance of the building is given up to a display of Oriental carpets and rugs. The walls are completely covered by them. They hang in long folds from the pillars and the railings, and are festooned along the lines of the landings, so that the stairway is completely transformed, and though the general appearance is rather dark, the idea is a good one, and might well be carried out in some of the public buildings, to relieve the coldness of the stone-work. A temporary staircase has also been erected at the west end of the central hall, forming quite a feature in the general aspect of the Exposition. It is very conveniently arranged, with easy ascents and six broad landings, on each of which are very comfortable cushioned chairs and sofas placed to command good views down the long hall; the newel-posts are adorned with bronzes, while at the head of the upper flight is the statue of France which received a medal at the last *salon*. There are a few interesting exhibits in the gallery. Braun & Co. send samples of their fine carbon photographs; there are some neat bronzes and one interesting exhibit of art furniture. There are also some examples of the common school furniture. The French do not excel in this last line. Their school furniture, as a rule, is such as no Boston school committee would even look at. Last year one of the Paris papers, in speaking of the American exhibit of school furniture, said that it was altogether too elegant for children to use; that it was calculated to make them despise their humbler surroundings at home. Perhaps this is true as regards French urchins; but such furniture as this exhibited to-day is not even comfortable, and if clerical educators can provide nothing better we would call for Jules Ferry and Article 7.

The ruined palace of the Conseil d'État, destroyed during the

[1] As I write I experience a long day of drenching Attic rain, and am exceedingly uncomfortable, protected by shelter which was more effective against thunder-storms of the North Sea and snow-flurries of the Austrian mountains.

[2] Fortunately the mistaken note had no bearing upon any argument or question involved. Yet Mr. Davidson sarcastically proceeds, "Mr. Clarke finds in this passage confirmation for a theory," etc., though the quotation was held to bear upon nothing further than the existence of a ceiling, and though hyperoön galleries existed in this temple of Olympia, according to the testimony of Pausanias, which he quotes in the same breath. The words ἐκ σκοτίων μυχῶν were *not* translated "out of dark temples."

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Commune, is, if practicable, to be restored and transformed into a Hôtel des Postes, to replace the present restricted quarters in the Rue J. J. Rousseau. M. Guadet, of the École des Beaux-Arts, has begun studies for the work, and is now visiting Berlin and London to investigate the post-office departments of those cities. It may be regarded as one of the fruits of the international expositions that the French are willing to hunt for an idea anywhere outside of France or Italy.

The sudden death of Viollet-le-Duc has caused a profound feeling among all cultivated people, and all, even his opponents, can unite in honoring his memory. Several of the papers have had extended notices of his life and works. The Republicans mourn him as a leader in the new party. The Bonapartists speak of him as a personal friend of the Empress, to whom he owed many favors and for whom he made the restoration of the château of Pierrefonds. The *Siècle* of the 28th ult. devotes a long article to the work of Viollet-le-Duc as lieutenant-colonel of engineers during the siege of Paris. For the past fifty years, it is said, he has worked at least twelve hours every day; and single-handed, without prestige obtained from long studies at the Beaux-Arts, and almost in the face of public opinions on art, he has worked his way up to the very top of his profession. He was an avowed free-thinker, and, according to his expressed will, his burial was purely civil. The town counsel of Lausanne, learning that his wish had been to be interred where he should die, opened for his body a cemetery long since closed, fulfilling a desire he had once uttered, that there might be his resting-place; and the *Siècle* continues: "On his tomb, according to his wish, will be placed simply a stone with the inscription, '*Viollet-le-Duc, né en* 1813, *mort en* 1879.' That will be all, but those who have known him, passing by, can say, — and it is the best and truest *éloge*, — 'That was a *man!*'" C. H. B.

CLEOPATRA'S NEEDLE.

THE MACHINERY FOR TRANSPORTING IT.

THE gigantic framework which is to be used to raise the Obelisk of Alexandria from its present vertical position, throw it into a horizontal position, and carry it down to the vessel which is to bring it to its new site, was yesterday shipped for Liverpool on board the Guion steamer Nevada. The total weight of the whole construction is 128,000 pounds, but it is in such heavy parcels that great trouble was met with in the efforts to ship it. When the Nevada reaches Liverpool the construction will be transhipped to Alexandria, in Egypt, where work will be begun under the supervision of Lieutenant-Commander Gorringe, U. S. N., for the removal of the monolith.

The machinery has been constructed at the works of John Roebling Sons' Company, manufacturers of wire rope, and bridge and general contractors, in Trenton. The plan of removal is entirely original, and as Mr. Roebling says, himself, "there has been nothing like it constructed before." It is a "special structure contrived to shift the position of obelisks from vertical to horizontal."

The first thing to be done will be to encase the monolith in a casing made of 2-inch oak planking, which will be bound at intervals of 3 feet with strong iron bands. This done, the obelisk will be guyed at the top from four points, like the mast of a vessel, so that there will be no possibility of its falling over.

The centre of gravity has been calculated to be at a point 26 feet above the base. Here will be placed trunnions on either side, which will be bolted across the sides by eight 1¾-inch iron and four 2-inch steel bolts. The trunnions are historical in their way. They are cast from cannon-metal only, and many of the cannon used were captured from the Confederates during the war, besides which they are the heaviest castings of their kind ever made. The trunnion-plates are 4 inches thick, 9 feet wide, and 6 feet high. At the centre is the turned trunnion, which is 33 inches long and 18 inches in diameter. The weight of each trunnion and plate is 1,250 pounds, making them together 1¼ tons. The metal used in the casting is of the best quality, a sample taken from the same heat having broken at a tensile strength of 2,900 pounds to the square inch. It is seldom that such excellent metal has been obtained.

The next operation will be to quarry out four 6-inch channel-ways through the base of the obelisk, and to insert beams which are to assist in raising it from the foundation.

The foundations for the towers will next be constructed. They will consist of two platforms, one on each side, of 3-inch oak planking, each 6 feet wide and 24 feet long. On top of these will be set four oak sticks, 12 by 18, firmly bolted together. The iron-work of the towers will then be built on top of the preliminary foundation. This consists of one wrought-iron tower placed on either side of the monolith. Each tower is made of six 12-inch heavy wrought-iron I-beams, spreading out at the base to a distance of 21 feet, and converging at the top to within 5 feet. The beams at their base rest on four heavy I-beams, and are securely riveted to the platform by means of plates and knees. Placed on top of these posts are caps, each 5 feet long and 30 inches wide, which are also secured by means of plates and knees. The posts are braced from top to bottom by angle and channel-irons, making the towers perfectly rigid. Placed on the top of the caps and securely bolted to the tower proper are cast-iron journals which weigh 3,700 pounds each, forming the grooves for the trunnions to work in.

A 6-inch rib is cast on the bottom of each of the trunnions, and in these ribs there are four 2-inch holes. Through each of these holes 1¾-inch iron rods are inserted, connecting with similar rods from the 6-inch I-beams running through the base by means of right and left thread turn buckles, which will be used to raise the obelisk from its foundation, and throw the weight on the trunnions. The foundation will then be removed and the obelisk will be left hanging free.

On account of the stone having an unknown factor of safety when supported at its centre of gravity, or at either end (according to some authorities as low as one and one half times), it has been deemed advisable to strengthen the stone by means of 1¾-inch (diameter) wire-rope stays, which are run over a frame 9 feet high resting on the trunnion, which is intended to be uppermost when the stone is in a horizontal position, to either end of the obelisk. The stays will relieve each end by some 25 tons, thus preventing any possibility of the stone cracking at its centre of gravity. Having taken every precaution, and got the obelisk into a free position, it can then be easily turned. This will be a matter of very little exertion, provided the structure is perfectly aligned.

When the obelisk is placed in a horizontal position, Lieutenant-Commander Gorringe will next proceed to build two piles of beams placed crosswise. As soon as they reach the height of the stone, jacks will be used to lift the latter out of its trunnion bearings and block it up. All the construction will then be taken away and foot by foot the obelisk will be lowered to the ground by reducing the piles, first from one side and then from the other.

Once on the ground the obelisk will be encased in an iron cradle, which consists of a parabolic truss on each side, connected by means of heavy channel floor beams and braces. To the floor beams two heavy channel bars will be riveted, and corresponding channels will be laid on the ground to form the train for the obelisk to move on, which will be accomplished by inserting 8-inch cannon balls into the grooves formed by the channel bars. The track will be laid 60 feet ahead of the cradles, so that as the stone is pushed along, the track behind will be taken up and placed in the front.

The castings of the iron-work were made by the Phœnix Iron Works Company of Trenton, and the carpentering work will be done abroad.

The description of the obelisk as used by Mr. Roebling to make his calculation is as follows: 67 feet 2 inches high; 8 feet 2½ inches by 7 feet 9¾ inches wide at base; 5 feet 2 inches by 5 feet wide at top. Substance, granite; centre of gravity distant from base, 26 feet; surrounding (character of) soil, sand.

The structure, with very little difference in the manipulation, will be used to erect the obelisk when it is brought to New York. — *The New York World.*

THE DETROIT COMPETITION.

DETROIT, MICH., October 13, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — In your editorial remarks in your issue of the 11th instant, on the public market question of this place, occur the words: "One only wonders at those who keep such competitions alive by contributing to them," which is constructively (though probably unintentionally) a reflection on myself. Being desirous to be not considered one who would wilfully take a course in opposition to a correct professional tone, allow me a word of explanation. In general, I wish to see built a creditable class of buildings; in this particular I interested myself to that end, being assured by members of the committee that the premium offered was but part of a full commission to be paid. If the design made by myself had been adopted it would have been on that premise. In the light of later events, I can but consider myself the victim of false pretences, and to have been seduced by the blandishments of the alderman, whose subsequent vilification needed no treatment but silence.

Respectfully, etc., CHARLES H. MARSH.

A MILLIONAIRE'S CATHEDRAL.

GARDEN CITY, LONG ISLAND.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Sir, — Please allow me to correct a few mistakes of your correspondent "M." in his article, "A Millionaire's Cathedral."

First, my name as the modeller of the stucco ornament is Brierley, and not Bradley.

Second, the ornament is certainly not unexampled in profusion in this country, as a visit to the churches of the Immaculate Conception, Lowell, Mass., and St. Patrick's, Norwich, Conn. (both finished in the last four years), will fully convince him.

His criticism of the defects of scale is scarcely fair. At least it would be better to wait and view it in its proper place, and colored, before passing an opinion on it. But I may be grateful for the fact that, after the scathing he has given the Cathedral generally, he found anything at all to admire in the modelling.

Hoping you will make the correction in the name,

I remain, respectfully yours,

JAMES C. BRIERLEY.

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NOTES AND CLIPPINGS.

The Indiana State House. — The Commissioners for the erection of the new State House at Indianapolis state in their ninth quarterly report, that during the three months ending September 30, $50,699.74 have been expended, making a total outlay since the commencement of the work of $153,665.56. Of this amount $75,805.12 have been spent upon the foundation, and $40,251.81 for iron-work.

An Opera House Fire. — The following case is exceptional enough to deserve special mention. The storm on the 22d of August at Munich, Bavaria, was followed next night by a fire at the National Opera House. A series of performances of Wagner's "Nibelungen" operas were to be given in honor of the international art exhibition, and they were inaugurated on Saturday, the 23d, by the performance of "Rheingold." Toward the close a flash of lightning is supposed to cleave the clouds, revealing a sudden change of situation. The clouds were represented by folds of gauze, which hid from view the change of scenery that was being carried out. The artificial lightning set fire to the gauze, and the flames at once sprang up, seized the flies, and spread rapidly through the scenery. The audience behaved with great presence of mind; there was not the slightest disturbance. Two of the chief actors addressed them, and, having explained what had happened, requested them to wait quietly. A fire-proof drop scene, made of thick steel plates, was let down, completely cutting off the stage from the auditorium. Then a powerful fire-extinguishing apparatus, with which the theatre has been lately provided, was applied with such vigor and promptness that the fire was completely extinguished in a very few minutes. The orchestra had continued playing while the extinguishing process was being carried out, and the opera was brought to a conclusion almost as well as if no interruption had happened.

The Paris Museum of Decorative Arts. — In consequence of the temporary occupation for municipal purposes of the Pavilion of Flora, the Museum of Decorative Arts has been obliged to vacate its late quarters. The Government has assigned it in requital a section of the east side of the Palace of Industry, near the workshops of the scene-painters of the Opera. These new quarters are very large, and can easily receive the necessary alterations. The work of refitting is actively forwarded. In a few weeks, therefore, the Museum of Decorative Arts will be able to reopen its doors to the public. The administration intends to utilize the intervening time in adding to the collections which are to serve as models for artists and artisans. A very important gift in books and engravings has just been made the museum by M. Turquet, Under Secretary of State for the fine arts. — *Le Technologiste.*

Tenement Life in Dublin. — The Royal Commission inquiring into the sanitary condition of Dublin finds as yet no lack of evidence condemnatory of its state. For example, Mr. Park Neville, city engineer, attributed the high death-rate of Dublin to the state of the Liffey and the wretched nature of the dwellings in the poorer parts of the city. The Liffey he described as an open sewer, into which 200 tons of sewage went every day. An extensive scheme for artisans' dwellings was absolutely necessary, as there were in the city 1,331 houses in a ruinous and unsanitary condition. The chairman (Mr. Rawlinson), Engineering Inspector of the English Local Government Board, remarked that it was impossible for language to describe the wretched state of the tenements he had seen in Dublin, — they were not fit for brute creatures to live in, not to say human beings.

New Hotel in Berlin. — A colossal hotel is being completed opposite the new Central Station at Berlin. It will contain immense apartments, luxuriously furnished and tastefully decorated, and 500 bedrooms, besides a theatre, two chapels, and a synagogue. The court-yards are to be adorned with statues of the most celebrated travellers, and attached to the hotel is a magnificent garden, in which there are several hot-houses.

Fire Apparatus in the Louvre. — A thorough system of water-supply in case of fire is now being completed in the Louvre. This important work was begun in 1876, but has been neglected for some years. Now, however, water-pipes have been carried along most of the galleries, with taps at regular intervals, and a complete apparatus of buckets, etc. The pressure of water from a reservoir at the top of the building is said to be great enough to allow of a complete inundation of any of the galleries in a few seconds.

The Via Sacra. — The famous Via Sacra in Rome has recently been repaved with stone from the Arch of Triumph to the Colosseum. This roadway, whose flagstones are still those over which the wheels of triumphal cars used to rumble on their way to the Capitol, had become dangerous to vehicles and needed repairs. The superintendence of "Excavations" accordingly decided upon merely inserting new pavement where necessary, and upon leaving the old historic stones in their places.

Artesian Wells in New York. — A significant feature in connection with the water-supply of this city is the increasing resort to artesian wells by large brewing establishments and other users of much water. Elias & Betz have a well 425 feet deep; Clausen & Price, a well 625 feet deep; David Jones, well 662 feet deep; George Ringler & Co., well 390 feet deep and going deeper; and P. Doelger, whose well in process of construction is intended to be 600 feet deep. As a rule these wells have a bore of 6 1-2 inches and cost from $6 to $10 a foot. Their great advantage lies in the cheapness of the water thus secured. The first well named is said to have paid for itself the first year. The Croton water tax paid by the larger breweries rises as high as $6,000 a year, and an equal outlay will usually sink an artesian well, securing a permanent supply independent of Croton water. The purity of the deep-well water is also an advantage, and the same may be said of its average low temperature — about 52 degrees Fahrenheit. The difference between that and Croton water at summer heat may make a saving of $20 a day in the ice bill of a large brewery. Artesian wells have also been sunk by manufacturers of mineral waters, that of John Matthews going down 300 feet. The deepest well, 1,001 feet, supplies the Higgins Carpet Factory with pure water for dyeing. — *Scientific American.*

Excavations at Phocæa. — Mr. Smith, the American consul at Smyrna, has applied to the Porte for permission to excavate Fokla, the site of the ancient Phocæa.

The Sutro Tunnel, Sutro, Col., October 15. — Yesterday about 2 o'clock connection was made by the north lateral branch of the Sutro Tunnel with a drift from the Mint company's shaft. The current of air is a strong downcast, and is of great advantage, for it insures an abundant supply of pure air, whereby the north branch, which is being advanced at the rate of ten feet per day, can be driven with still greater speed. The air goes down to the Mint shaft through the north branch in great volumes, and finds its exit through the Savage and adjacent shafts, greatly benefiting all parties. The prospecting drifts running northerly and southerly on the foot and hanging walls of the large ledge intersected by the main tunnel at eleven thousand seven hundred feet from the enterance are most encouraging, showing assays at from $8 to $40 per ton, and when cross-cutting is commenced it is confidently expected from the fair milling rock already met with that a bonanza may be encountered.

Japanese Paper. — Many varieties of paper are made in Japan, and all from the bark of trees. The best, and that most generally in use, is produced from a shrub called there Kozou (*Broussonetia papyrifera*), which grows to a height of about two metres and a half. It was introduced from China, and is now cultivated throughout Japan for this express purpose. It is ordinarily planted as a sort of hedge along the fields, the roots being about two feet apart. After a short time the branches interlace and form a very efficient protection against cattle. Under favorable conditions it sends out shoots three metres long each year, and it is said to produce as much as 1,800 kilos. of bark per hectare annually. The manufacture of the paper is conducted as follows: The stem and branches are laid in water for a fortnight, and if the water is stagnant the bark becomes gradually detached; if running, the outer coating, which is useless, is carried away. The interior layer is then peeled off in strips, combed, washed and dried, and put away if not to be used immediately. This is the raw material, and to convert it into paper it is subjected for three or four hours to the action of hot water and steam, which renders it soft; then it is pounded and vigorously beaten with knotty sticks. A sort of pulp is thus produced, which can be made as fine as is requisite. It is mixed with water in a vat, and taken out in the mould of the paper to be made. The Kozou paper is very strong, particularly in the direction in which the fibre extends. Owing to this property, the Japanese can employ their paper in many ways unknown in Europe. For instance, they use it instead of glass for their windows, bandages for wounds, pocket-handkerchiefs, cords, thread, etc. When a still stronger paper is required, the mould is again dipped in the pulp, but in a direction at right angles with the first operation, so as to have the fibre crossed, when it becomes extremely strong. This process is sometimes repeated three or four times until a product is obtained which is used for covering umbrellas, packing goods, making cloaks for travellers, etc. In these cases the paper is oiled and thus made impermeable to moisture.

Old House in Seabrook, N. H. — The "old garrison" house in Seabrook has been pulled down, and is to be sold at private sale. This house was built in 1616 for protection against the Indians, of white oak timbers seventeen inches square, which were laid with clam-shell mortar. It was very nearly opposite this old fortress that Caleb Cushing's mother was born and bred.

The Sale of Mr. Whistler's House. — "There was one painting, it is true, but as it was done on the drawing-room wall it could not very well be removed, the wall not being for sale separately. The purchaser of the house, therefore, obtains this work of art, which was the only curiosity in the place. It represents a demon, who is sitting on the roof of an old house with a piano balanced in front of him. On the instrument is a piece of music entitled "The Gold Scab, an Eruption, by Filthy Lucre." It is an undoubted Whistler, and the next occupant of the house will perhaps be proud of it, though opinions will differ as to the appropriateness of a drawing-room ornament of a devil sitting on the top of a house and playing the piano. Mr. Whistler is perhaps not sorry to have got rid of his white house, which was also a veritable white elephant."

Glue. — Glue which will stand damp is a desideratum. Few, however, know how to judge of quality, except by the price they pay for it. But price is no criterion, neither is color, upon which so many depend. Its adhesive and lasting properties depend more upon the material from which it is made, and the method of securing purity in the raw material, for if that is inferior and not well cleansed the product will have to be unduly charged with alum, or some other antiseptic, to make it keep during the drying process. Weathered glue is that which has experienced unfavorable weather while drying, at which time it is rather a delicate substance. To resist damp atmosphere well, it should contain as little saline matter as possible. When buying the article apply the tongue to it, and if it tastes salt or acid reject it for anything but the commonest purpose. The same operation will also bring out any bad smell the glue may have. These are simple and ready tests, and are the ones usually adopted by dealers and large consumers. Another good test is to soak a weighed portion of dry glue in cold water for twenty-four hours, then dry again, and weigh. The nearer it approaches to its original weight, the better glue it is, thereby showing its degree of insolubility. Glue frequently cracks because of the dryness of the air in rooms warmed by stoves. An Austrian paper recommends the addition of a little chloride of calcium to glue to prevent this. — *Capital and Labor.*

The Knox Monument. — A monument to John Knox is to be erected near St. Giles's Church, Edinburgh. The monument will be surmounted by a statue of the reformer, and figures of Hamilton, Wishart, Buchanan, and Melville are to be placed on the four corners of the pedestal.

Bridge at Grandenz. — One of the longest railway bridges in Germany is now on the point of completion. It crosses the river Vistula near Grandenz, and rests upon twelve piers. The length from the commencement of the first to the end of the last pier is 1,578 yards, or nearly a mile.

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AN exhibition of a somewhat unusual kind is to be seen in Boston. Last year Mr. Ruskin exhibited in London a large collection of drawings by Turner, with some of his own which were intended to illustrate them. Professor Norton, of Harvard College, thinking that the illustration of Mr. Ruskin's own work was a sufficient object in itself, and that it would be found interesting and useful on this side of the water, has induced Mr. Ruskin to send here a selection of his drawings, to which he has added some which were in his own possession, so that there are a hundred or more of them now on view in that city. They are arranged in chronological order, following out an idea of their author, who had said in the notes he printed for those which were in the English exhibition: "I have amused and humiliated myself by arranging a little autobiography of drawings from childhood until now; out of which it appeared to me that some useful points might be made evident respecting the science of particular methods or the danger of particular errors." Some parts of the autobiography, particularly the opening chapters, the visitor would perhaps be willing to dispense with, or at least to relegate to the obituary of which he will hope to be long spared the reading. But he will find the collection one of great interest. The drawings include a variety of subjects rendered by a variety of methods. Among them, as may be supposed, architectural subjects are prominent; there are also landscapes, studies of still life, of plants, and flowers. Some are simple pencil drawings, hardly more than outline, others studies in color or chiaroscuro with the brush. Persons who have got their conceptions of Mr. Ruskin's work only from occasional passages in his writings, or from the elaborate engravings published with them, are likely to be astonished at the extreme freedom of many of these drawings, at the regardlessness, some may think the recklessness, with which many characteristics of their subjects are passed over in the care for the particular characteristics which were the author's immediate object. Most observers will be struck with the abrupt change which came over Mr. Ruskin's manner at the time when he was at work on Modern Painters, — when he apparently first passed from under the influence of Prout to that of Turner, and then went on to develop his own native manner. Mr. Norton has printed by way of a catalogue such parts of Mr. Ruskin's notes on his drawings before exhibited as apply to these, with such additions as seemed to him apposite. It would be a pity if these drawings could not be shown elsewhere than in Boston, — for the sake of the many readers who are interested by Mr. Ruskin's published works as well as for their own interest as artistic studies. We may have an opportunity to say more of them.

THE fate of the Main Exhibition Building at Philadelphia, which is in the hands of the Permanent Exhibition Company, still hangs undecided. The license granted the company by the Park Commission three years ago to maintain the building for an international exhibition of industrial products contained a provision that the Commission might terminate the lease if the undertaking was not duly carried out. It was a reasonable provision; for to preserve the building at all was a considerable sacrifice of the park, one which had not been intended, and was only to be justified by putting it to some use which should be an actual public benefit, and which could not be provided for elsewhere. Last summer the Park Commission, finding that the serious business of the company languished, and that their exhibition, so far from justifying its claim to the building, had faded into the background and was overshadowed by a variety of rather trivial amusements which had been introduced to attract the public, that the building was not kept in proper repair, nor the grounds about in good order, notified the exhibition company that their license must terminate with next year, according to the original condition. Against this the company protested vigorously, and the directors having bestirred themselves in an effort to excite public interest, secure subscriptions, and put the exhibition on a substantial footing, an enormous petition was got up and a strong pressure was brought to bear to induce the commissioners to recall their notice, and give the exhibition another chance.

THE commissioners yielded so far as to notify the company that whenever they are "assured of a compliance with these provisions [of the license] by the company, and satisfied of the company's ability to conduct the enterprise in the manner promised, they will favorably consider the application of the company for a revocation of the notice, and for permission to reinstate the lease with all its provisions." "*With all its provisions*," however, seems to be a stumbling-block to the company, which reluctates at putting itself again under security. Within a few days the directors have accordingly sent to the Park Commission an address which has the look of an *ultimatum*, wherein, after reciting the difficulties with which their undertaking has labored from the start, they repeat the objection which they had before raised, that to have the danger of a revocation of their license hanging over them makes success impossible. "It is obvious," say the directors, "that it would be impracticable for the directors of this company to obtain the pecuniary assistance which would be necessary to make it what they would like to make it in all respects, so long as that summary power of removal exists and the order of removal stands." They therefore wish a greater assurance of permanence than their present license gives, and declare that "if the proposed change is not made, the only course open for the company is to comply promptly with your order of removal by closing the exhibition and disposing of the building occupied by it, as soon as possible within the time limited by the license." In the mean time the case of the exhibition is made harder by the discovery, which the Park Commission has made through analysis, that the drainage from the main building, as it is at present used, is assisting to seriously contaminate the little stream that flows into the Schuylkill through the Lansdowne valley just above the Fairmount Water-Works, which supply the city.

WE omitted to notice, when it was first announced by telegraph, the death of Mr. John Adams Jackson, sculptor, which occurred a month ago in Pracchia, in Italy, a little town in the Apennines, at the summit of the railway between Florence and Bologna, where he had gone for his health. Mr. Jackson was the last, we believe, of the little group of older American sculptors who made their home in Florence, only Powers and Hunt having preceded him there. He was born in Bath, Maine, in 1825. He first studied art in Boston, where, in his earlier days, he practised drawing portraits in crayon. Later, he went to Paris to study the figure in Suisse's famous *atelier*, and then to Italy, where he began as a sculptor in Florence, after working from the life in the academies of that city and of Siena. His bust of Miss Adelaide Phillips, the singer, made in Florence in 1853, first brought him notice. He returned soon afterwards to the United States, and established himself in New York, where he executed a number of portrait busts, among them those of Buchanan Read, for the Union League of Philadelphia; of George S. Hillard, for the New York Historical Society; of Judge Mason, and Dr. Lyman Beecher. In 1860, having received a commission for a bronze statue of Dr. Kane from the Kane Monument Association, he went back to Florence, where he fixed himself, and where thenceforth, except for occasional visits of a year or two to this country, he kept his residence.

THE most of Mr. Jackson's works were portrait busts, of which he left more than a hundred, it is said. He had a marked faculty for catching likenesses, and his likenesses were of a kind

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that made his works popular, so that many *replicas* of them are to be found. He also executed a variety of ideal figures, medallions, and reliefs; of these, too, many were repeated. Among them are statues of Autumn, Cupid Stringing his Bow, Cupid on a Swan, Hylas, the Culprit Fay, Titania and Nick Bottom (a bronze group), busts personifying Peace and Dawn, and a medallion called The Morning Glory, which has been many times copied. Of more important works, he executed in 1862 a marble group of Eve and the Dead Abel for Mr. Morehead, of Philadelphia, that added much to his reputation. In 1867, during a visit to New York, he modelled a group and several single figures, which were to be cast in bronze for the Gate House of the Reservoir in Central Park. These sculptures, we believe, have not yet been cast. Musidora, a subject from Thomson's Seasons, exhibited in Vienna in 1873, and afterwards in New York, won high praise. The sculpture in bronze for the soldier's monument in Lynn, built in 1874, was also Mr. Jackson's work. A spirited group in marble, called Pastorello, representing a shepherd boy of the Abruzzi playing with a goat, belongs to Mr. Nevins, of New York. His last important work, never finished, as we understand, was a second Eve and Abel, differently treated from the first, on which he had been busy a year or more, and which he looked upon as his *capo d'opera*. Mr. Jackson's works were marked by cleverness of pose, a good anatomical knowledge, a certain grace of attitude and of form, and a pleasant play of fancy, more than by power of imagination or of expression, we should say; nevertheless, the Eve and Abel has been warmly praised for its expressive pathos. His kindly companionship and genial manner will be remembered by all who had his acquaintance, and will lend a meaning to the story of a writer in the *Chicago Times*, who went to his studio after his death, and was met by his old assistant, saying, with tears in his eyes, "*Il buonissimo Signor Jackson è morto.*"

A question of some importance in regard to the liability of a city for its sewers has just been decided in Philadelphia by a referee. The inhabitants of one part of the city had some time ago petitioned the city to convert the Cohocksiak Creek, which drained their quarter, into a sewer. This had been done; but one day there came a rain so heavy that the sewer, though it had served for all ordinary contingencies, proved quite inadequate to carry off the water, which backed up and overflowed the property of the abutters, doing considerable damage. Thereupon several suits for damages were brought against the city, on the ground that it was liable for not having provided a sufficient sewer. These suits were by common agreement referred to a referee, Mr. W. Wynne Wistar, and we find in the Philadelphia *North American* an account of the decision which he has rendered. He holds that, since no defect appeared in the construction of the sewer, the damage, being due only to its small capacity, is to be attributed to an error of judgment in providing for ordinary, but not for extraordinary emergencies. "For an error of judgment," the referee decides, as a matter of law, "a municipality cannot be held liable." Therefore the suits are dismissed.

The decision of a referee naturally does not carry the weight, as a precedent, of that of a court, but it will stand till it is overruled, and in the mean time may be accepted as an indication of the tendency of the common law in a matter which is not, we presume, provided for by statute, and which, therefore, would be subject to the same laws in all our cities. Then follow certain inferences and questions which are of general interest. The sewer in question took the place, it seems, of a natural watercourse, and it was probably easy to make the mistake of not allowing escape sufficient for an extraordinary and therefore unexpected flood. In this case there was no choice but to admit the water to the sewer after it was built, whatever the consequences, and the only remedy is to build a new sewer. But it is the habit in all our sewered cities to admit the street wash into sewers which are built for drainage merely; in sudden and extreme rainfalls these are liable to be gorged, and to set back the flow in private drains that empty into the lower parts of them. Damage is often suffered from this cause, and one may ask whether, where it is found to occur, a city cannot be held to exclude the street wash from its sewer, or be made to pay for the injury. If an error of judgment has been found to cause damages, is there no defence if it is repeated, or no way to enforce its correction when it is made manifest? The law as laid down by the referee is very sweeping. Though an individual is held responsible for the consequences of his mistakes, a municipality is not. The only thing, then, for which a city is liable in its constructions is faulty workmanship, one may conclude, — for the rule is obviously not confined to sewers. It would seem to follow that if a bridge tumbled in, or a city building fell down, through faulty design or lack of sufficient material, the city was not liable: if the trouble was bad mortar or weak castings the city might have to pay for damage done. Faults of planning are errors of judgment; apparently only faults of workmanship are left to be classed as punishable errors. It strikes us that "errors of judgment" is a pretty elastic term, and might be made to cover most of the obnoxious things that towns may chance to do. It is difficult to draw the line between permissible stupidity and culpable ignorance; or perhaps no such line is to be drawn, and nothing is left open to redress but wilful malice and proven fraud. With the means of redress is taken away the only opportunity which is commonly open to enforce the abatement of an injury. There is no doubt that the blundering action of municipal authority often does great injury to individuals. If municipalities are not liable for their blunders, the individual who suffers from them is in a bad way unless he can right himself with the two-edged sword of politics. We do not presume to criticise the legal decision of the referee, but we think inconvenience is visible in its consequences.

THE RECOLLECTIONS OF SIR GILBERT SCOTT.[1] I.

Sir Gilbert Scott, dying in the thick of the battle, has left behind him, besides the countless monuments of his conscientious and skilful practice, the written record of a splendid career in the singularly interesting volume of reminiscences which appeared some months ago, and of which we are thus tardily to give some account.

Every professional career is interesting to the men who are fighting out the battle of life on the same line. What do lawyers, doctors, or ministers, what do merchants, or mechanics, or tradesmen, talk about, when they meet, with such interest as the current history of their fellows? A noble sympathy, a generous rivalry, a mean jealousy, all add zest to this interest, and make it universal and keen. Perhaps it is nowhere keener than among architects, whose calling occupies so indefinite a place among the industries of civilized life; whose lives are commonly so plentifully seasoned with the emotions and vicissitudes which appeal most strongly to the sympathy of their fellows, and are least dreamed of by the world at large; whose successes are often so brilliant, and whose failures are so blank and disheartening.

A professional life like that of Scott, including almost every variety of experience to which an architect is subject, especially when set down by his own hand, and when the story is told, as in this case, with frankness and unreserve, furnishes a body of *mémoires pour servir* which can hardly be too highly prized.

Ten or twelve years ago we were all reading the memoirs of Sir Charles Barry, the first architect of the century who had risen to deserved eminence, and whose biography, although not written by himself, contained much of the history of English architecture for a generation at the period when it was emerging from the ignoble condition in which it had been sunk for near two hundred years. Barry was sixteen years older than Scott, and although the latter in his reminiscences alludes to him in one place as "my dear friend, Sir Charles Barry," this is almost the only mention of him in the book, and it nowhere appears that there was any professional intimacy between them. The two men were, we should think, of very different temperament, and as different in their lines of practice; yet there was much likeness in their lives. Both were full of enthusiasm for their profession, and of energy and untiring industry in the practice of it; both rose by their own exertions from a humble origin to the head of their profession; both experienced in their successes the tyranny of the men who wielded the power of the Government, and the meaner jealousy of their less successful brethren; both were rewarded by the Queen with the honor of knighthood; and to both, when their work was done, was granted the supreme recognition, — consolation to every British heart for all the stings and arrows of life, — a grave in Westminster Abbey.

Of Scott, as of Barry, it may be said that his rapid rise into a large practice at an early age was made comparatively easy to a man of his earnestness and power of work by the badness of the work which the other architects were turning out. When he began to build, about the year 1835, being then twenty-four years old, Barry had already established his reputation in London by the Travellers' Club House, Bridgewater House, and the Reform Club, and sundry large mansions in the country. The prevailing style in London, however, found expression in Regent Street, the Bank of England, the National Gallery, and buildings of that class. In the country churches were beginning to be built in the Gothic style, but a Gothic so feeble and characterless as to be almost worse than the mongrel classic which it displaced. Scott's boyhood was passed in

[1] *Personal and Professional Recollections by the late Sir George Gilbert Scott, R. A.* Edited by his son, G. Gilbert Scott, F. S. A., etc., etc. London. 1879.

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a little country village, where his father was "perpetual curate." His grandfather, Thomas Scott, was the author of the well-known commentaries on the Bible, and lived in a neighboring parish. The boy's relations with parish notables of various sorts were thus somewhat wide-spread and influential, a circumstance which stood him in good stead at his entrance into professional life. The strong love for picturesque architecture, which led him to pass much of his leisure (of which, being one of a large family, with no schools near, he had plenty) among the old churches and houses within rambling distance of his village, resulted naturally in his being put, at the age of fifteen, through a course of mathematical and architectural study, under the superintendence of an uncle who was a man of leisure and had the knowledge of an amateur. A year or two later he was sent to London, and entered at the office of one Mr. Edmeston, of whom we are told that he was more of a poet than an architect, and that the feelings of awe and veneration which his young pupil had properly entertained for his master were rudely dispelled on the first morning after his arrival, when Mr. Edmeston invited the boy to take a walk with him and see some of his works, which were found to consist of "a few second-rate brick houses, with cemented porticoes of two ungainly columns each." Scott had been feeding himself for years on the remains of old English Gothic, and the revulsion was severe. His master informed him that "the cost of Gothic architecture was so great as to be nearly prohibitory; that he had tried it once at a Dissenting chapel he had built at Leytonstone, and the mere cementing of the exterior had amounted to a sum which he named with evident dismay." It seems, nevertheless, that though the atmosphere of the office was not the most inspiring, yet Scott contrived to get pretty well grounded, during his stay there, in both the principles and the practice of architecture. He taught himself perspective out of a book in a fortnight so thoroughly that he never again had to refer to any book on the subject. His master had a good architectural library, of which in his evenings Scott availed himself fully. In his summer holidays he devoted himself to measuring and sketching among his beloved Gothic buildings in the country, making in the evenings, on his return to the office, elaborate tinted drawings of what he had measured; concerning all which labor "Mr. Edmeston wrote seriously to my father, warning him that I was employing my leisure hours on matters which could never by any possibility be of any practical use to me."

At the end of his four years with Mr. Edmeston, he placed himself, by the advice of a surveyor, with a firm of London builders, engaged in extensive works, to whom he rendered such service as he could, in return for the freedom of their workshops and of the buildings on which they were engaged. One of the partners of this firm, known later as Sir Morton Peto, was in after life of much assistance to him. He was not long with these builders, but he says with emphasis, "It is impossible for me to exaggerate the advantage of this arrangement in giving me an insight into every description of practical work."

After this he was for two years an assistant to his friend Mr. Roberts, who had just obtained the appointment of architect to the new Fishmongers' Hall, and who occasionally made him clerk of the works at one and another of his buildings. By the time this engagement was at an end he had begun to think it time to get into practice. A singular opportunity occurred just at this time which launched him at once on an extensive line of practice. The new Poor Law Act had just come into operation, under which neighboring parishes joined together, under boards of guardians, to provide and maintain union workhouses. All over the kingdom, then, there sprang up a sudden crop of these buildings. The chief commissioner employed one Mr. Kempthorne, a friend of Scott's, to prepare some normal designs for the proposed workhouses. Kempthorne, knowing that Scott was desiring to commence practice, wrote to him, saying that offices adjacent to his own were vacant, and if he chose to take them he could employ his leisure in assisting him in his workhouse drawings. Scott accepted the proposal and went to work. A few weeks later came the news of his father's sudden death, leaving his mother with nine children, of whom five were younger than himself. It became necessary for him to put himself at once in the way of earning a livelihood. "The two steps I took were, first, to write a sort of circular to every influential friend of my father's I could think of, informing them that I had commenced practice, and begging their patronage; and, secondly, to quit Kempthorne, and to use my interest to obtain the appointment of architect to the union workhouses in the district where my father had been known. Both steps were happily attended with success. Several friends placed small works in my hands, and I succeeded by a strenuous canvass of every guardian in obtaining appointments to four unions in our immediate district."

He had thus plunged at once into the work of his life, and from this moment knew little of leisure or rest. The years which succeeded seem, as he says, "an era of turmoil, of violent activity and exertion. For weeks I almost lived on horseback, canvassing newly formed unions. Then alternated periods of close, hard work in my little office at Carlton Chambers, with coach journeys, chiefly by night, followed by meetings of guardians, searching out of materials, and hurrying from union to union, often riding across unknown bits of country after dark, sudden sweet peeps in at my poor mother's new home, ... with flying visits to Gawcett and elsewhere, as occasion served."

For the first few years his practice seems to have been pretty much confined to the union workhouses. Almost at the outset he had invited an acquaintance of long standing, of whose ability he had had ample experience, to come and assist him with his working drawings. This connection soon ripened into a partnership, and Scott & Moffatt grew to be a familiar sound in the ears of Poor Law guardians and many others over half the counties of England. Scott can hardly say too much of his partner's energy, enterprise, intelligence, and ability. "The effect of the new arrangement was magical," he says. "He followed up union-hunting into Devonshire and Cornwall with almost uniform success, and my poor little quartette of works around my old home soon became as nothing when compared with the engagements which flowed in upon us as partners. Moffatt's own exertions were almost superhuman, and when I recollect that no railways came to his help I feel perfectly amazed to think of what he effected."

Here is an amusing account of the competitions for the unions, which "were conducted on principles peculiar to themselves. They were open in every sense, and each of the competitors was at liberty to take any step he thought proper. They used first to go down and call on the clerk, the chairman, and any of the guardians who were supposed to have any ideas of their own; and after the designs were sent in no harm was thought of repeating those calls as often as the competitors pleased, and advocating the merits, each man of his own arrangement. On the day on which the designs were to be examined, the competitors were usually waiting in the ante-room, and were called in one by one to give personal explanations, and the decision was often announced then and there to the assembled candidates. Moffatt was most successful in this kind of fighting, having an instinctive perception of which men to aim at pleasing and of how to meet their views, and to address himself successfully to their peculiar temperaments. The pains he took with the arrangements were enormous, communicating constantly with the most experienced governors of workhouses, and gathering ideas wherever he went. He was always on the move. We went every week to Peele's Coffee-house to see the country papers and to find advertisements of pending competitions. Moffatt ran down to the place to get up information. On his return we set to work with violence to make the design and to prepare the competition drawings, often working all night as well as all day. He would then start off by the mail, travel all night, meet the board of guardians, and perhaps win the competition, and return during the next night to set to work on another design. I have known him travel four nights running, and to work hard through the intervening days. . . . . He was the best arranger of a plan, the hardest worker, and the best hand at advocating the merits of what he had to propose I ever met with."

Of the abrupt dissolution of this partnership at the end of ten years of almost unexampled success a curious account is given, which does not present Mr. Scott in an altogether attractive light, though it is to be presumed that something is withheld which would furnish some justification of what seems from his own story to have been an unwarrantable harshness, not unmixed with cowardice. "A constantly increasing desire," he says, "had grown up in my mind to terminate my partnership with Mr. Moffatt. My wife was most anxious upon the subject, and was constantly pressing it upon my attention; but my courage failed me, and I could not muster pluck enough to broach it. At length Mrs. Scott took the bull by the horns. She drove to the office while I was out of town, asked to see Mr. Moffatt privately, and told him that I had made up my mind to dissolve our partnership. He was tremendously astounded, but behaved well, and the ice thus broken, I followed up the matter vigorously. This was during the latter part of the year 1845, and at the close of the year an agreement was entered into dissolving our partnership then and there *de facto*, but taking one year as a year of transition, and delaying the actual dissolution till the close of that year. Though Mr. Moffatt occasionally kicked hard at this, I must do him the justice to say that he behaved fairly and straightforwardly throughout."

Scott competed for his first church in 1838, when he had been in practice three years, and got it. "This was at Lincoln, and I cannot say anything in its favor, excepting that it was better than many then erected. Church architecture was then, perhaps, at its lowest level. . . . . Unfortunately everything I did at that time fell into the wholesale form, and before I had time to discover the defects of my first design its general form and its radical errors were repeated in no less than six other churches, which followed in such rapid succession as to leave no time for improvement, all being planned, I fancy, in 1839, or early in the succeeding year."

His practice steadily widened. The Memorial Cross at Oxford, the Church of St. Giles, the Orphan Asylum at Wandworth, the Jail at Reading, were among the successful competitions of the ten years of his early partnership with Moffatt. Shortly before this partnership was dissolved occurred the famous competition for the Church of St. Nicholas at Hamburg, in which Scott bore away the palm from Germans and French alike, by the award of Zwirner, to whom the decision was after much delay referred. Scott seems to have fully realized before entering this competition that it was a critical point in his career, and he prepared himself for it by a month of travel through Belgium and Germany, in order to make himself familiar with the Gothic of those regions, hitherto nearly or quite unknown to him. Singularly enough this was his first visit to the Continent, and though of necessity a very hasty one, he seems to have got great pleasure as well as advantage from it. He was in

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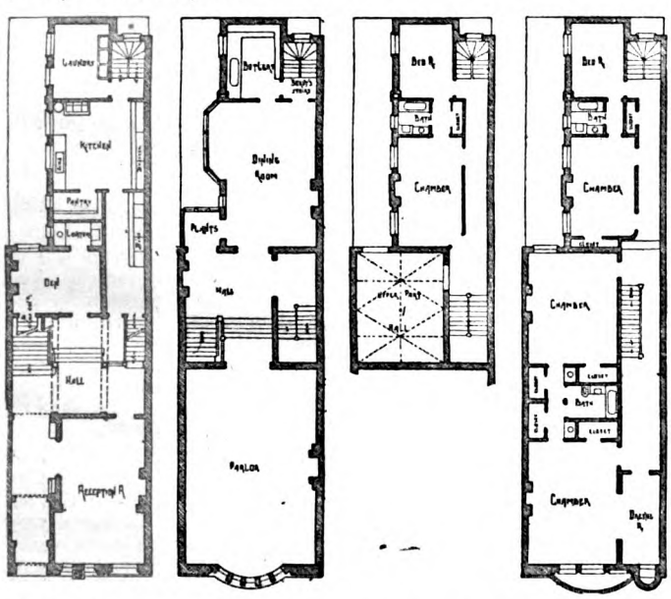
much perplexity at Cologne as to whether he should make his church Romanesque or Gothic, and thinks if he had known at that time that the German Gothic was but an offshoot from the French, he might have made his design round-arched. As it was, however, he adopted thirteenth-century Gothic, made his first sketch of a design on the steamer between Hamburg and London, and set vigorously to work on the drawings as soon as he got home, — as indeed was sufficiently necessary, for he had but a month of time remaining before they were to be sent in. Mr. Street made many of the best drawings, "coming out now for the first time to my observation, in the prominent way which has since characterized him."

The effect of these drawings in Hamburg when the designs were exhibited is represented to have been "perfectly electrical." The press of that city broke forth into pæans of grateful and admiring praise, poetical and otherwise. One writer declared the design to be pervaded by the spirit of Erwin von Steinbach. Another (but this was a poet) was sure that an angel clothed in light must have hovered around the *wack'rer Meister* as he was working out his thought, etc. Ground was broken for the church in October, 1845, and the corner-stone was laid a year later with great pomp. Scott was violently attacked in the *Ecclesiologist*, which must have been a British newspaper of immense respectability, but was not Roman Catholic, as might be charitably supposed, for furnishing designs for a Lutheran church. One might imagine this an easy thing to bear; but our architect, instead of laughing at such incredible foolishness, took it *au grand sérieux*, and wrote a solemn reply, which fills twelve pages of this book, but which the virtuous newspaper consistently refused to print.

THE ILLUSTRATIONS.

ALTERNATIVE DESIGNS FOR A CITY HOUSE, NEW YORK, N. Y. MR. BRUCE PRICE, ARCHITECT, NEW YORK.

As shown by the appended plans the house is to cover an ordinary twenty-five foot city lot.



SMITH ACADEMY, ST. LOUIS, MO. MR. T. C. YOUNG, ARCHITECT, ST. LOUIS.

The school for which this building is now in course of construction, at the corner of Nineteenth Street and Washington Avenue, is connected with Washington University. The building will cost $40,000.

LIGHTNING CONDUCTORS.

A case of injury to a church by lightning has lately been reported in the papers, which very conveniently illustrates our remark that one conductor applied to the tower is of no avail to protect the whole building. A church near Shrewsbury was lately struck by lightning during divine service, and the narrative informs us that "strangely enough," the high square tower and its conductor were quite undamaged, but that the lightning came through the roof of the choir, passing down by the organ pipes, and seriously injured five members of the congregation who were in the chancel, and who were "badly burnt and had their feet cut by the electric fluid." The roof of the chancel was much injured.

Now let us inquire into the cause of this not uncommon kind of occurrence, and see why the conductor on the tower could not defend the chancel, and what ought to have been done by the architect who erected the conductor so as to provide against such a casualty.

We must begin by reminding our readers that elevated points on the earth's surface exert no attractive power on the lightning. The attractive forces tending to bring together the positive and negative electricities, as we described in our first paper, are exerted between two extensive planes, namely, those of the cloud and of the earth under it, and consequently the exact line in which the flash takes place will depend upon a variety of circumstances; so that, although the highest point of a building may form a passage for the shock, it is not the only one, and is by no means the cause of the discharge, which would take place, sooner or later, between the ground and the cloud, even if the building were absent. We may say that there are three causes in general, not to mention other local and particular circumstances, which will often induce the lightning to strike a less elevated, in preference to a more elevated, portion of a building. First of all, there is what we may call the "bellying" of the cloud, or protuberance of its lower surface, whereby it may happen that this portion may be in reality nearer to some low part of a building than any other part of the cloud is to the more elevated tower, and consequently the flash will occur between the cloud and the low structure. Then again, in the second place, we must remember that thunder-clouds are often driven past by the wind, and that ragged portions of cloud are thus drifted along frequently at a very small elevation above the earth, so that flashes will strike out in this way, horizontally against the sides of the building. And, in the third place, bifurcation, and even trifurcation, will sometimes occur; by which means, while one portion of the flash will strike the higher parts, another portion will dart off to a lower section of the building.

There is, therefore, no difficulty in understanding how the chancel of a church may be struck by lightning, even when the tower is efficiently protected itself by a good conductor. For the fact is, that what is called the "radius of protection" of a conductor is by no means extensive. Arago and De la Rive agree in considering that a conductor can only defend from injury a circular space around it, whose radius is twice its height, measured from the point of the building from which it rises. And even this rule is far from being absolute, for it will vary with the form of the rod, as well as with the nature of the building, to say nothing of the differing circumstances of each storm.

What is, then, our remedy? How are we to conductor a building so as to render it secure in every part? This question has been admirably worked out by Professor Clerk Maxwell, who begins by proving that a space is absolutely defended from lightning which is covered in with a conducting substance; so that, for instance, a man in complete armor is perfectly secure in a thunder-storm, and so is a powder-magazine if the building is wholly sheathed with sheet-copper. No matter if the building contain metallic structures, such as engines, etc., provided they are entirely within it. But if any conductor, such as a telegraph wire, or a water-pipe, enters such a building from without, the "potential," or electrical condition of this conductor may be different from that of the building, and it must, therefore, be connected with the conducting shell. In practice, of course, it would be quite impossible thus to cover the entire surface of a large structure, such as a church, with copper. So Professor Clerk Maxwell goes on next to prove that this is by no means necessary in order to prevent any sensible effect if it were struck by lightning. It is quite sufficient to enclose the building with a network of conductors. And this may be conveniently effected practically in three ways: First, by taking care, if the structure has many salient points and angles, such as turrets and pinnacles, that each and every one of these is furnished with a good vertical conductor, of such a height that its "area of protection" may overlap those of other conductors near it; secondly, by forming a metallic skeleton of the building, — or, in other words, by laying copper rods along every edge, horizontal and vertical, and connecting these all with one another and with the main conductors; or thirdly, and which is most to the purpose in ordinary cases, by arranging so that all metallic masses, such as lead roofs, water-spouts, iron girders, and so forth, shall have connection with one another and with the various conductors erected on the building. It is, therefore, by no means a difficult matter for an architect who understands his business to render a church, say, secure by following one or all these methods, according to circumstances. Let him, for example, erect several main conductors, — one down the chief tower, if it is a cruciform church, and one down the east end of the chancel, and a third down the west end of the nave; and let him connect with these all the masses of metal outside the building, taking care (in case there are not enough of them to form a tolerably close network) to supply their place by copper rods along the edges. No ordinary thunder-storm could then injure the church. It is, in fact, due to an unconscious observance of these rules that American houses are notoriously free from injury by lightning, although storms are frequent in the United States, for the houses are commonly covered with metal roofs, connected by tin or copper gutters and shoots with the ground. The only unprotected parts are the chimneys, which are easily secured by short lightning rods soldered into the roof.

Again, some special parts of a building may happen not unfrequently to be so formed or situated as to be peculiarly obnoxious to injury. Projecting cornices, for example, may be better secured against lateral strokes if they are defended by a horizontal and projecting conductor, — provided, of course, that this is well connected with other conducting rods. Nor is it altogether useless to have one or two horizontal rods proceeding thus from the main conductor itself, at right angles to its length, and several feet below its pointed summit.

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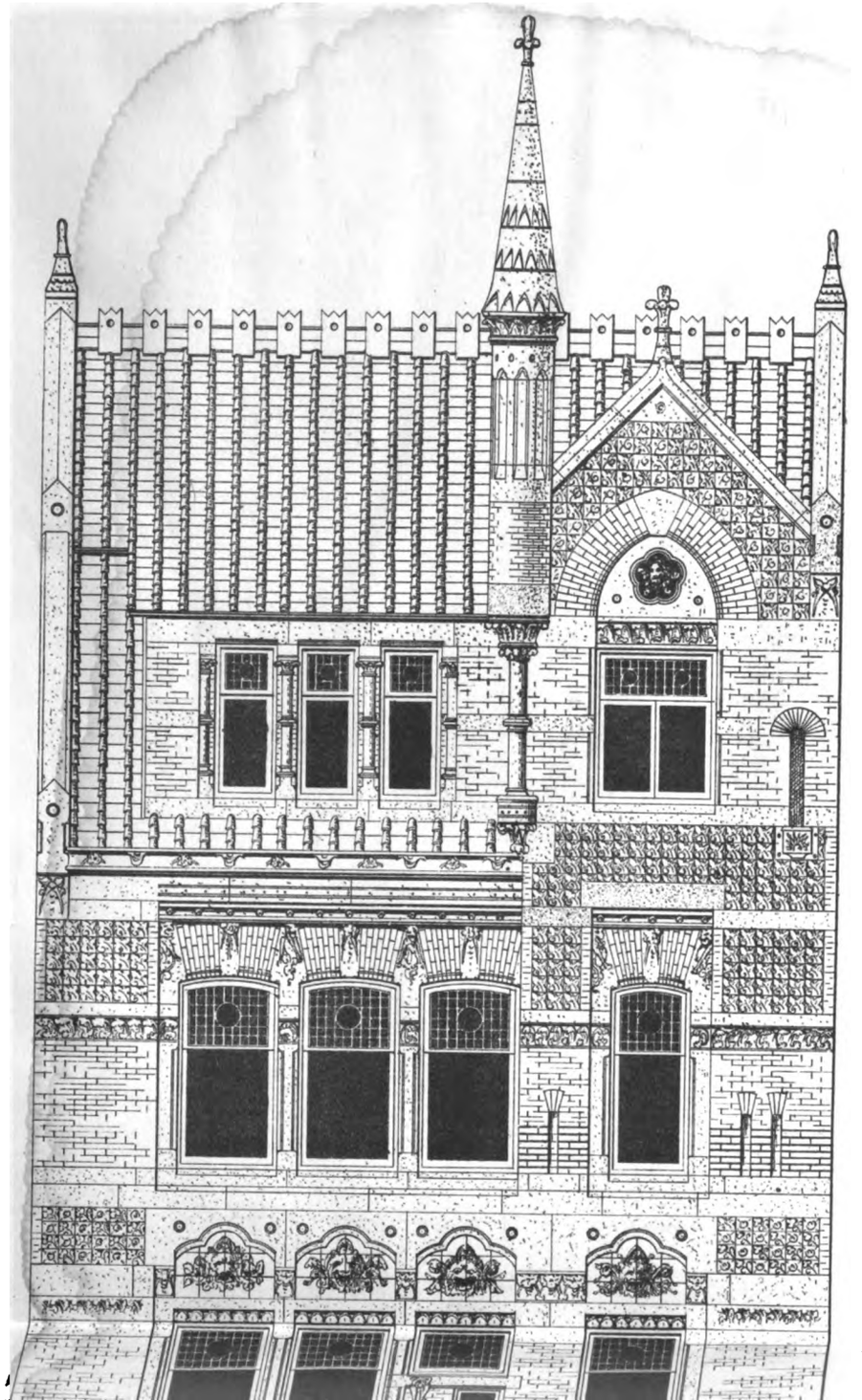

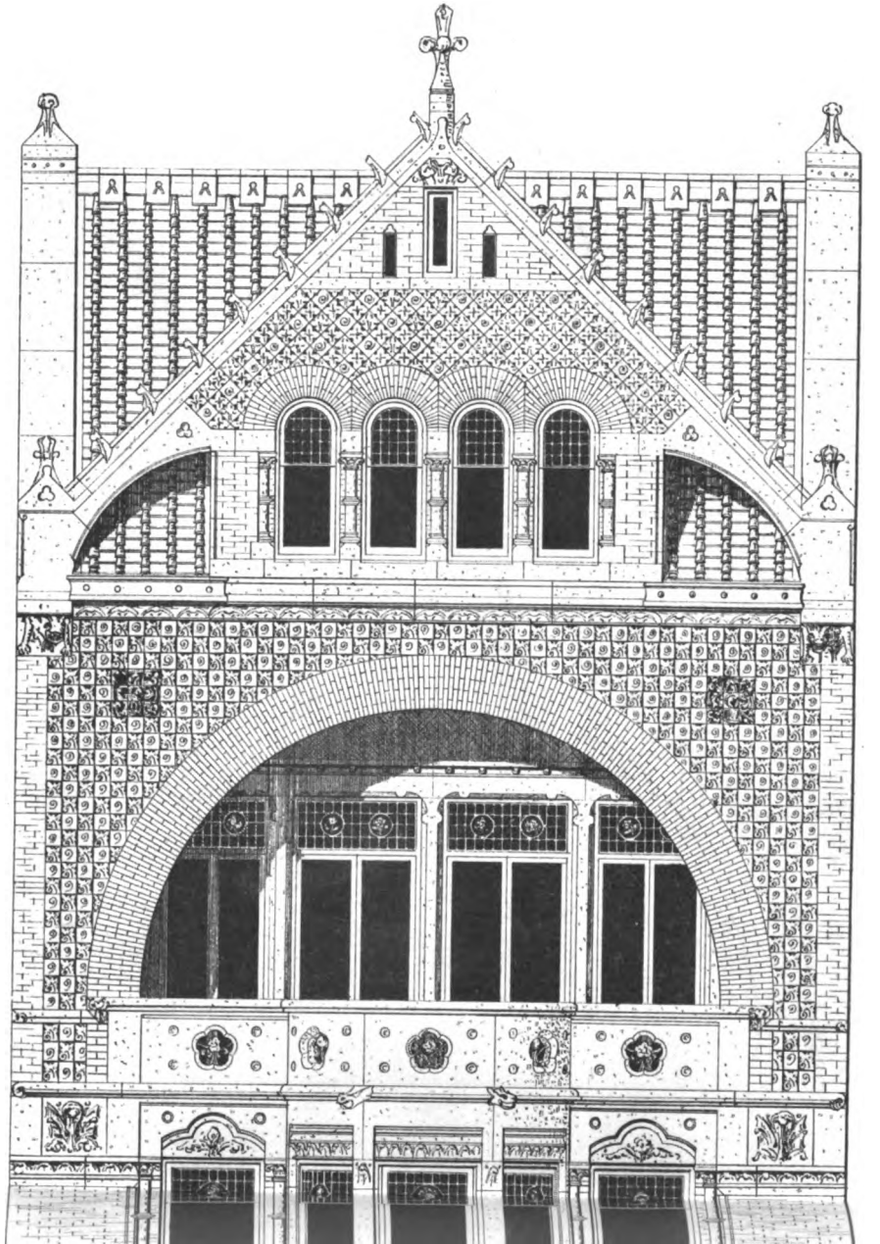

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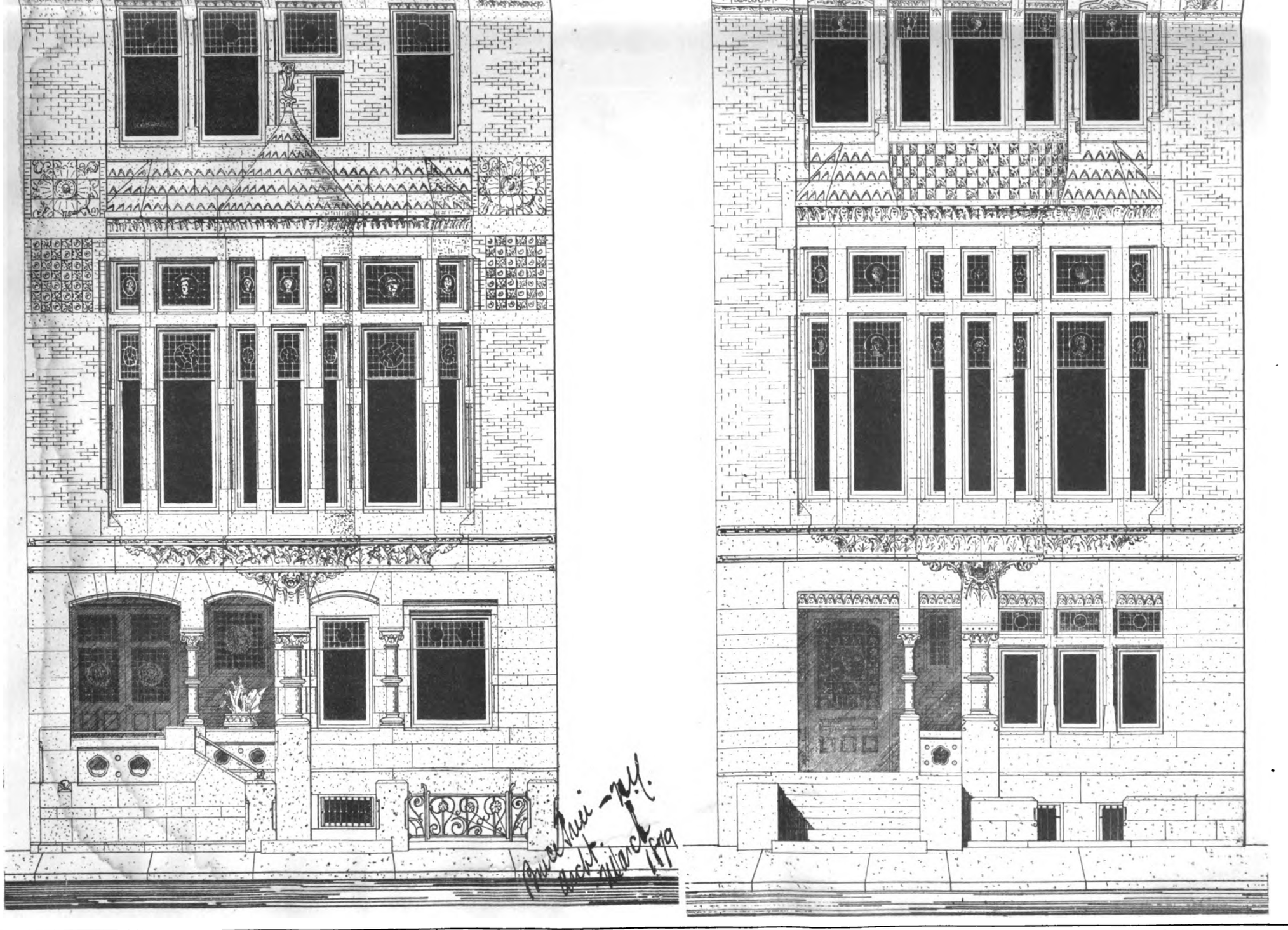

ALTERNATIVE DESIGN FOR A CITY HOUSE

MR. BRUCE PRICE ARCHT

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

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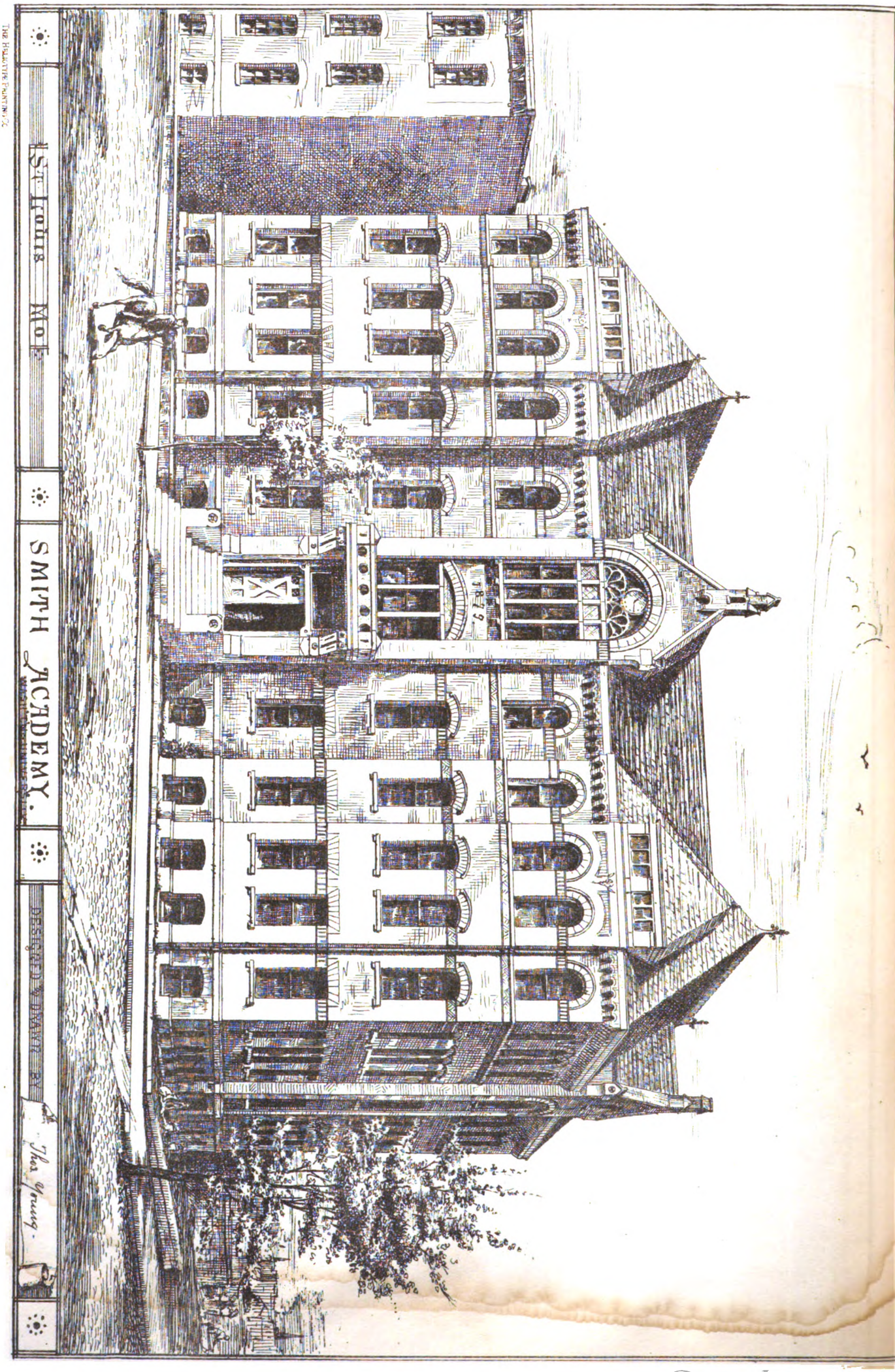

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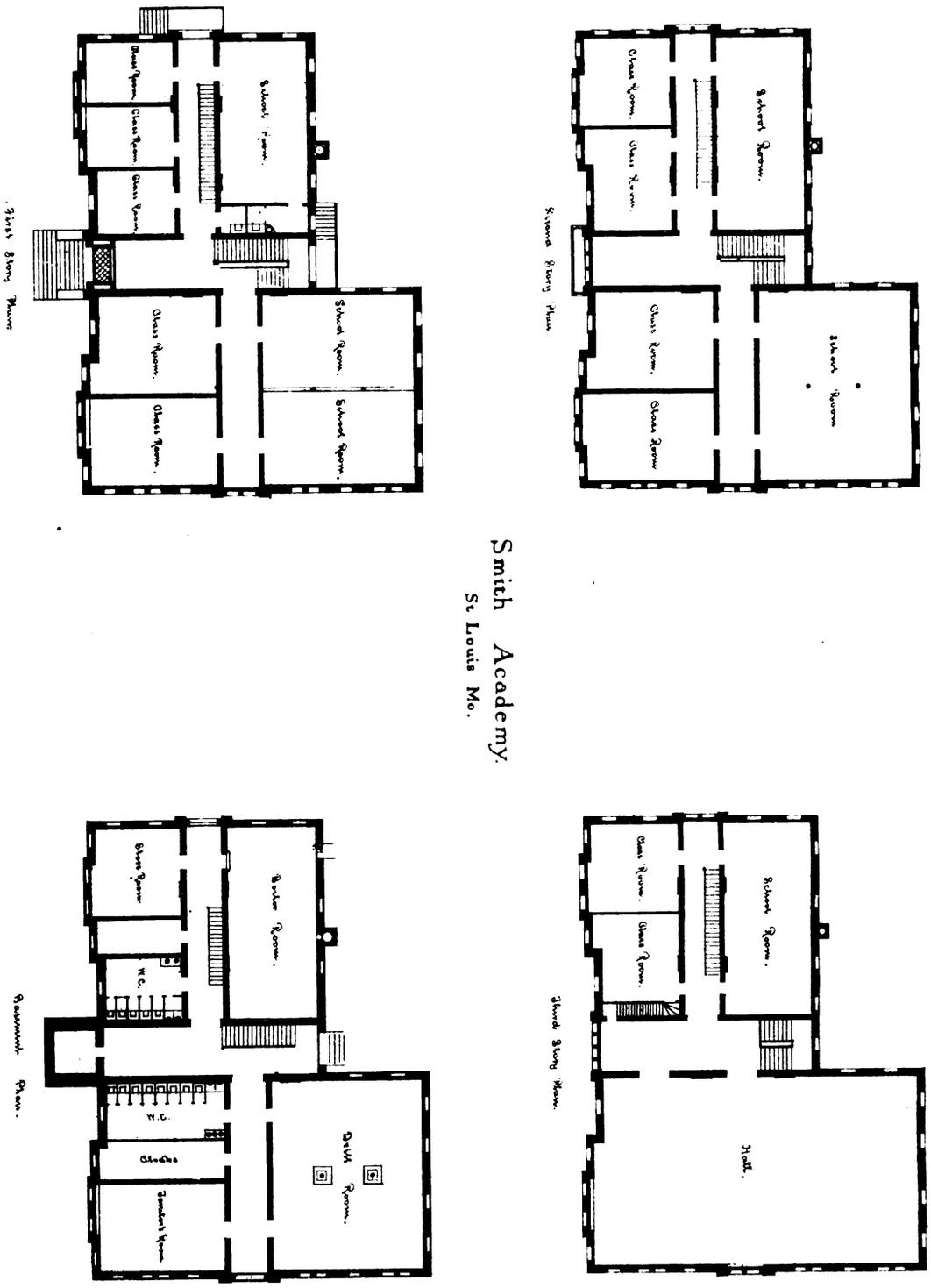
THE HELIOTYPE PRINTING Co.



Smith Academy.
St Louis Mo.

Thos. K. Young

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Moreover, it will generally happen that one face of a tall spire or chimney conducts the lightning better than the other sides, and this is found to be usually that which looks to the southwest, because, as most of our storms and rain come from that quarter, such face is often damper at all times, and is, at any rate, soonest wetted by the approaching storm. The effect of this was well seen in the injuries suffered in 1836 by the spire of St. Michael's Church, near Cork, which had no conductor. The southwest face was literally rent all down in a straight line, the stones and cramps being hurled out to some distance. The rain had made this the line of least resistance, but not of sufficient conductibility to carry off the discharge without damage. So likewise in the case of a tall chimney or flue, where the hot air and ascending smoke form a conducting pillar and the rain wets one side more than others, place your conductor on the southwest side of the structure in preference to the other sides.

Such being the general conclusions at which modern science has arrived as to the theory and application of lightning conductors, let us, before quitting the subject, notice briefly one or two points which may be of interest to the practical reader.

There is no doubt, we think, that every large house in the country, and not merely extensive buildings, such as churches, factories, etc., should be furnished with a good system of lightning conductors, for all edifices are at any time liable to be struck. But we cannot too much insist upon the fact, that unless such conductors form a network over the building in the way which we have described, they are comparatively valueless; while, unless they have also a good connection with the ground, they are even worse than useless, — nay, highly dangerous. We have heard of a gentleman, lately retired from business, and who, having built for himself a large suburban villa residence, consented to his architect's advice to have his house conductored. This was done, and to all appearance very effectually; for not only were conductors erected on all the chimney-stacks, but these were fully connected with the water-pipes, and all of them joined to one main conductor, descending vertically from the highest point of the whole building. And yet, as it turned out, this house was a most dangerous one to live in in a thunder-storm! The gentleman was asked one day by a scientific friend where the main conductor entered the earth, as no sign of it was visible below a certain point. He did not know, and, in fact, had never inquired; but on examination, it was found that this chief conductor, with which all the others were connected, entered a cupboard in the drawing-room, and there stopped, hanging suspended above the floor, near the fire-place, at a distance of a yard or so from the ground! So that, as a matter of fact, and through the ignorance or carelessness of the architect, this gentleman had been actually sitting day after day in his easy-chair, close to this unfinished conductor, and in exactly the same kind of situation during thundery weather as if a loaded gun were pointed at him, ready to go off at the slightest action! So very important is the communication of the conductor with the earth.

We have already adverted to the action which is exerted by pointed conductors in silently tapping the thunder-cloud and depriving it of a portion of its electricity, whereby the number and violence of the strokes is materially diminished. Our readers are also doubtless aware that the formation of hail is intimately connected with the presence of a large quantity of free electricity in the atmosphere. If then, as Arago has shown, we were able, by the erection of pointed conductors on buildings all over the country, combined with the similar influence exerted by tall trees and forests, to withdraw a large portion of the electricity thus silently from the clouds, the hail would either not be formed at all, or would remain in its rudimentary state, so that all that was precipitated would be a harmless, extremely minute hail or sleet. Can any one, he says, doubt the great benefit which agriculture — to say nothing of greenhouses and conservatories, and such-like glass structures — would receive from the disappearance of hail-storms? All that would be necessary would be that persons in all parts of the country, instead of insuring crops and so forth against hail in the usual insurance offices, should combine together to spend their money rather in erecting as many lightning conductors as possible on their houses, barns, and ricks, and so mutually benefit each other and the country at large. But until such an experiment has been tried on a large scale, we can hardly judge of the results; and we must be content, therefore, merely to suggest the subject and to leave it, on Arago's authority, for consideration by all who are interested in the matter, either as a theoretical possibility or as a mere impracticable scheme, which may, perhaps, some time or other, be more fully developed, when, possibly, compulsory lightning conductors may rank with compulsory drainage and water-supply. — *Building World.*

THE GREAT QUARRIES OF MISSOURI.

THESE rich quarries consist of (1) granite, — red and gray; (2) marble, — pink, yellow, brown, buff, red, black, clouded, mottled, and spotted; (3) alabaster, — handsomely translucent, consisting of all colors from that of brightest champagne to the darkest coffee or Malaga wine shade; (4) freestone, — white, gray, blue, buff, and brown. The granites are in southeast Missouri, and are found in the several counties of Madison, Perry, Cape Girardeau, Bollinger, Iron, Wayne, Reynolds, Carter, Scott, Butler, and Ripley. The marbles occur in most of the same counties, and in some ten or fifteen others off to the west and northwest in the long and wide-rolling Ozark chain. The alabasters are seen in the vast labyrinthine caves of the mountains which are cut down by the Merrimac, the St. Francis, the Current, the White, and the Osage rivers, and by their numerous beautiful affluents. These caves are of remarkable size and of scientific interest. Some of them along the Merrimac are miles in extent and ramify in all directions, with lofty roofs and broad, open vaults where thousands of tons of richly-colored alabaster can be quarried and whence they can be easily shipped to the St. Louis and San Francisco Railroad, within a few miles, by which the markets of the world can be reached at cheap freights and in quick time. The distances from the localities where the almost numberless alabaster caves exist are, say, three to eight miles by good wagon roads, then by rail fifty to one hundred miles to St. Louis, and here taking barges and flatboats for the Lower Mississippi, or these drawn by steamtugs to the heads of navigation on 10,000 miles of waters in some twelve or fifteen States of the central parts of the Union. These are facts that establish the value and importance of these store-houses of architectural treasures and materials for the decorative arts. Slabs and large blocks in obelisks, tombs, mantels, table-tops, and vases have been quarried out, shaped, carved, and polished up. These new sources will supply an alabaster in America which will be found to rival and even excel many of the beautiful marbles of Italy, Spain, and Egypt. The most costly carvings of clock-frames, lamp-stands, boudoir ornaments, vases, and furniture coverings and in-layings are made from the Carrara white marbles and the pure alabasters of the Mediterranean countries which have been known and used for probably more than three thousand years. Alabaster is a condition of lime-rock in which the carbonates and sulphates of lime come into existence by what may be called geologically a secondary growth. Alabasters, or most of them, proceed either from changes wrought upon subterranean stratifications of limestone by earthquake movements and upheavals, or from slow and gradual accretions in the natural caves, that is, by watery solutions of lime flowing from the upper strata of mountains into hidden passages below, and there solidifying into new rock-masses. Thus it is seen that Aragonite, found first in Aragon, Spain, is formed, which is a species of crystalline and fibrous alabaster; also stalactites, the pendents and aqueous drippings of caverns, and stalagmites, their obverse representatives, rising from the floors of the same caverns, are all of them varieties of alabaster. In the Missouri caves the thicknesses of these formations are immense, probably varying from twenty to two hundred feet. They are compact, and of uniform fineness of texture, of agreeable diversities in color and shade, have good bedding, parting, and cleavage for quarrying, and the masses all show smooth, broad faces for polishing. In Crawford, Franklin, Washington, and other counties are large alabaster caves which have been explored by visitors for many miles. The aggregate lengths of the windings of some of these caves are known to be as much as three to five or seven miles, and the extremes of some have as yet never been reached. It is believed that they connect, and that their long arms extend to and ramify with other caves whose mouths are visible in the surrounding regions.

The freestones of Missouri have been a great dependence for the best buildings in St. Louis and other prominent cities of the Mississippi Valley. Large quarries have been working for forty years past at Warrensburg, on the Missouri River. These and all the freestones of Missouri are variably silicious or calcareous, as localities change, or as necessities of choice require either one or the other kind. They have every pleasant color, from white through the different hues of yellow, buff, gray, green, pink, blue, and brown. The strata are of great thickness, ranging often from fifty to two hundred and fifty feet, and the natural beddings or layers are from one foot to ten feet or more in thickness. Many large blocks are constantly being taken out and shipped to extensive buildings in various parts of the West, which frequently measure from two hundred to four hundred and fifty cubic feet. These freestones work well under the several labors of quarrying, dressing, chiselling, and smoothing. They make fine mouldings, capitals, columns, obelisks, or broad tables; they are used for architectural statuary, and can be also worked into small statuettes.

Although this rock is so uniformly excellent in every quality, and its superabundance and accessibility recommend it to general adoption, nevertheless skill and judgment are especially required for the determination of places to open up quarries and plans for testing the enduring qualities of the rock they contain. It was a fatal mistake, for instance, that was made some years ago in undertaking to build a new capitol at Columbus, Ohio. Lime-rock had been selected with apparently proper care. It was shaped, dressed, and duly laid in the walls, and the costly building was rapidly advancing when winter frosts arrested its further progress. In the spring following the greater part of the masonry was nothing more than a mass of shale! The testing of building materials, a precaution of the highest importance, is too often neglected in our country. Some architects and builders, indeed, take no account of it.

The freestones of Missouri are very generally excellent. Some, like these of Warrensburgh, require very careful scrutiny to avoid quarries that contain disintegrating strata. In some prominent buildings of St. Louis, where it has been used, and in some principal parts of the structures, this freestone has not endured because it is too aluminous and argillaceous, and not silicious and calcareous,

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as it should be. The latter two ingredients should be nearly or quite pure, with no admixture of other elements.

The red granite of southeast Missouri, which is really a sienite, with a coarse, granular texture, is one of the handsomest building stones in America. It is comparable to the red granite of Peterboro, Scotland, of which, in numerous cemeteries of the Atlantic cities, and also in some near our interior towns, there are seen large and costly mausoleums and very lofty obelisks. This is imported at heavy outlay, and during the past twenty-five years, on account of its rarity and the great beauty of finish which it takes, wealthy families have preferred it for their sepulchres. The red sienite is believed to be practically imperishable. "Cleopatra's Needles" — the principal one said to be eighty-six feet high, and consisting simply of one stone, and decorated by numerous hieroglyphs — are represented to be of a variety of red sienitic granite.

The St. Louis, Iron Mountain & Southern Railway, operating for the past fifteen years, traverses the whole granite belt of Missouri, beginning at about one hundred miles southwest by south from St. Louis, and continuing thence on the same course for the distance of two hundred miles or more, to and even beyond the State boundary of Arkansas. The width of the belt varies from forty to one hundred and twenty miles. In respect to its geology and mineralogy, it is one of the most interesting fields in the United States, awaiting exploration and development. ††

TESTS FOR PORTLAND CEMENT.

In treating of "matrices" Mr. Henry Reid, whose recently published treatise we have lately received, makes some observations upon the characteristics and properties of first-class Portland cement which may be of interest to some of our readers. He observes first, as regards weight, that it should not be less than 112 pounds per straked imperial or Winchester bushel; second, as to strength, measured by its tensile capacity of resistance to accurate vertical tension, it should not be less than 300 pounds per square inch; third, texture or fineness of powder should be as nearly as possible equivalent to 2,500 atoms to a square inch, or, in other words, a sieve of that gauge (50 square) should not reject more than 10 per cent of the cement when gently shaken by the hand, and it should feel roughish to the touch; fourth, as regards hydraulicity, it should possess a capacity of resisting the solvent action of water during at least six days' immersion, and when taken out it should not exhibit crack or fracture of any kind; fifth, as to color, the true color resembles the best quality of the well-known Portland building stone, namely, a grayish blue or steel-gray; sixth, as to setting, when mixed neat with a proper quantity of water it will set in from one to six hours, according to its weight and density; seventh, chemical analysis, a good average cement, capable of passing the preceding tests, would produce within a moderate divergence of range the following analysis: —

Lime	60.05
Magnesia	1.17
Alumina	10.84
Silica	24.31
Alkalics	1.54

Mr. Reid shows that imperfect blending of the raw ingredients, or insufficient calcination, is often a cause of inferior products. This carbonate of lime, if used in excess, produces a hard and dark clinker, difficult to reduce to a powder, and rough to the touch. The lime also becomes hydrated and swells, and endangers the mass. Excess of silica or alumina causes a brown dusting clinker easily ground into a soft powder, but incapable of attaining hardness. The presence of carbonic acid has an injurious tendency. A good Portland cement is intermediate between the over-limed and the over-clayed cement. For the manufacture of concrete, Portland cement is superior to the other two cementing agents, the blue lias and the Roman cement, and Mr. Reid observes, where it can be obtained without heavy charges for carriage, it may be regarded as being cheaper than the commonest hydraulic limes.

The author refers to General Gillmore and other American authorities on cement, but the most interesting investigations are those recorded by Mr. Maclay as to the relative effects of different temperatures on the tensile strength of Portland cement. Mr. Maclay refers to a large number of barrels of Portland cement that were guaranteed by the manufacturer to exceed in tensile strength 250 pounds per square inch. The cement, when tested, was found to be less than 200 pounds per square inch. It was found, on inquiry, where the fault in testing lay. "The room where the testing was carried on was heated by a stove, the temperature during the day ranging from 60° to 70°, but at night it sometimes fell below 40°. The gauged cement, after immersion in the water, was thus subjected to a very low temperature." All the cement was retested, the water in which the briquetts were kept being then maintained at a uniform temperature of 60° day and night. It was found that 1,370 barrels, first tested 185 pounds per square inch, when retested gave 317 pounds per square inch; that 1,373 tested first at 192 pounds gave 285 pounds, and the same number of barrels first tested 236 gave, on retesting, 289 pounds. These experiments conclusively point to the fact that temperature has a decided influence, and that when the temperature of the water is raised the tensile strength is increased. — *Building News.*

BELL-FOUNDING.

The *Ipswich* (England) *Journal*, in describing a peal cast for Weybread church, refers as follows to some innovations in fixing bells: —

The old timber framework was removed, and has been superseded by a framework entirely new, and composed, with the exception of the bell-wheels and rope-pulleys, of iron. The clumsy, ponderous oak beams, which form the bell pits, and which are generally to be seen in churches, are supplanted by a strong iron framework, much lighter and more simple looking. The frame is based upon two iron girders, and the smaller bells are hung above the larger ones. The girders support iron strains, which in their turn support the stocks on which the small bells are suspended, and on the lower flange of the girders rest similar but shorter strains, which support the larger bells, hung beneath the others. The girders are braced together with tie-rods, and cross-pieces so firmly hold the whole framework together that it is perfectly rigid, and none of the motion noticeable in the ringing of bells in the old wood framework is to be seen. The framework is entirely new to the majority of people, but in that respect it is not unique, for there is at present another iron framework in existence. But what makes it unique is the fact that the whole of it, with the exception of the stocks, is composed of wrought-iron, whilst the other frame mentioned is of cast-iron. With all the advantages of the new frame, its cost is no greater than the old ones. The bells themselves differ from others in several respects. The founders had, by careful study of the best old bell-founders of the country, nearly succeeded in casting a maiden peal (bells which come from the foundry and need no trimming to bring them to the right tone are called maidens), but numbers 2 and 4, the last ones cast, were, by an error, made just a trifle flat. The amount which these two bells were out of tone was so slight that it was contemplated to put them up as they were, but they were sharpened to the proper tone, and the peal, therefore, has four maiden bells. The method of attaching the bells to the stocks is quite new. Instead of the canons generally used, let into a heavy block of wood which forms the stock, there is a mushroom-shaped top which is extended into the stay, and fastened there by a bolt, and when the bell is up for ringing the stay rests on a swing slider which it can press a few inches on either side when resting on it, and in that manner the bell is supported when up, and this, also, is entirely new. The stock is a great improvement. In the place of the great wooden blocks to be seen in other churches, a cast-iron bar is used, and instead of embedding the top of the bell in it, as is done with large bells with wooden stays, the stock is curved in greater or lesser degree, according to the size of the bell. The great feature of the bells, however, is the clapper, which is constructed in such a manner that, after striking the bell, the clapper does not remain on the side of the bell. This has been attempted before, but the plan having been tried by means of springs it has failed. The plan adopted by the Redenhall Company is a simple one. The shank of the clapper is a hollow tube which slides on an iron arm. The shank slides on the arm for about three eighths of an inch, and the centrifugal force of the bell's swinging throws the clapper out to the end of the arm, and it thus strikes the bell; the shank then falls by its own gravitation back to the other end of the arm, and then the clapper rests on a cross-piece at the top of the bell, and the striking part of the clapper is about an eighth of an inch from the side. The clapper is made of a softer metal than the bell, and this, besides improving the tone, prevents the clapper from wearing away the side of the bell; but the clapper, which is easily repaired, wears by its action. This attempt is undoubtedly the most successful that has been made to keep the clapper from resting on the side of the bell. Instead of swinging with gudgeons on bearings, as is usually the case, the ends of the stocks of these bells serve as gudgeons, and work on friction wheels or roller bearings. Another feature of these bells is that by striking the bells in the waist each one gives its note in major 3.

THE POMPEIIAN CENTENNIAL EXCAVATIONS.

The opening ceremonial ended, a bell rang to summon people to the excavations. In different parts of the ninth region ten chambers were to be opened and their contents revealed, and there was an eager rush from all points. It is impossible to describe the intense expectation on every face as the first picks struck the ground, or the scene around each place to be excavated. Crowds were pressing round every opening. People were perched all along the tops of the broken walls, to the imminent peril of their limbs, and groups were thickly gathered along the higher unexcavated level, and on every other point of vantage. Each room to be excavated had been cleared of the upper falling-in, leaving about four feet to be removed. The indications given by the preparatory work in one of the larger rooms having been particularly favorable, I took my station there, and witnessed in the course of three hours, as the various objects peeped forth from the scoriæ one by one and were taken up, such a revelation as I shall never forget. For the first five minutes there was a breathless silence as the men worked; then, as the scoriæ fell away, part of a green object became visible. In a moment the workmen's hands had cleared the space around it, and amid deafening cheers a small bronze horse, nine inches in length, was held aloft. Then a large amphora appeared; then two bronze vases,

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one with handles; then a large iron key, and as each in turn was lifted high for all to see, "*Bene, bene!*" burst in a chorus of hearty satisfaction from the people. A list, with the briefest description, of the things which then followed in rapid succession would fill a column. There were at least a dozen bronze vases of different shapes, sizes, and uses, with and without handles, and in one a number of bronze coins oxidized together; and many other coins were found at intervals during the excavation. There were many handsome bronze fibulæ, several bronze bracelets, a number of rings, many terra-cotta vases, tazze, and amphoræ, and a remarkable number of little terra-cotta water-cups for bird-cages, various kitchen utensils, a spit, forks and knives of iron, a bronze bottle, a number of little bronze bells, a dagger with ivory handle, a knife with ivory handle, a bronze casserole, and a terra-cotta money-box. After these and many more objects, of which trayful after trayful was carried away, had been taken out, a mass of black material appeared, which, falling to pieces, proved on examination to be beans; then a quantity of millet and hemp seeds, with considerable remains of the sacks which had contained them, the carbonized wood of grain-bins and of a barrel with iron hoops, and great masses of the beams of the upper floor, sufficiently solid, but entirely carbonized like charcoal. Among these remains a splendid bronze candelabrum was come upon, but its tall, slender, fluted stem was broken. In short, from noon till three o'clock a continued succession of objects was revealed, almost more rapidly than I could note them down. The mere names and briefest memoranda filled sixteen pages in a large note-book. Some of the rooms revealed nothing, others a few bronze and terra-cotta vessels; but in one room a skeleton was found, and in the smallest chamber opened four were discovered huddled together. — *London Times.*

A PREHISTORIC EXCAVATION.

LATELY a gentleman by the name of Shassern, living about eight miles southeast of here, in that section of country long known as Chimney Pierre Hills (the name was derived from an ancient pier or pillar of stone, now demolished, about fifteen feet high, shaped like a chimney, with a sunken square in the base, as though cut out for a fireplace, and supposed by many to be a relic of those wonderful prehistoric people, the mound-builders), came to the city and detailed the wonderful discovery of a cavern cut in the solid rock, which, if as represented, will take its place among the most remarkable and wonderful of archæological discoveries.

The account of the discovery as given by Mr. Shassern is, in substance, as follows: Early yesterday morning he started out in search of a sheep which had strayed from his flock. Following along a little path through the hazels skirting the foot of the immense bald table of rock known as Chimney Pierre, he heard the faint bleating of a sheep, apparently from behind a great standing splinter torn from the mass until a broad fissure parted the two. Thinking his animal had become entangled in this fissure, he sought to steal around the fragment next to a precipitous bluff, when he lost his footing and fell over some fifteen feet, alighting upon a smooth, flat stone concealed in a dense mass of undergrowth. To his intense alarm the stone began to sink beneath the surface, and before he could recover from his fall he found himself in the midst of a vestibule cut out of the solid rock, the walls of which were adorned with the most vividly-colored paintings of men and animals. The ceiling, which was dome-shaped and about eleven feet above the floor, was adorned with the figure of a giant-sized man in the act of placing fagots in what appeared to be designed to represent the sun. Upon the sides were painted in black and brown colors the figures of animals he says he never saw even pictured — huge tusked and trunked beasts, like elephants, with masses of shaggy hair falling about their heads and shoulders; great cat-like beasts striped like tigers, and with tusks protruding from their mouths. In the midst of this throng of wild beasts, upon a yellow background, is delineated the form of a man, seated in some kind of a vehicle, much like — from Mr. Shassern's description — an ancient Roman chariot. The whole of these paintings bear inscriptions which could not be read. On one façade of this prehistoric temple (for such it must have been), this artist of antiquity had depicted birds and fowls, curious and gorgeous, score after score of them, says Mr. Shassern, none of which he could recognize as now common in this country. The colors he describes as peculiarly charming and bright. — *Cincinnati Commercial.*

THE MEDIÆVAL ARCHITECT IN FICTION.

WE have not read an English novel called "The Ambassador Extraordinary," but we have been amused, as doubtless our readers will be, at certain extracts from it which we find in the English building journals. They chiefly concern one Master Georgius Oldhausen, a conspicuous character in the book, an architect who, with a rather diverting exaggeration, typifies the impracticable whims of the ultra mediæval architect of our day. We quote a few passages, the first describing the architect's own lodging-room, which he had labored to convert into a thirteenth century hall.

"The ceiling he has long ago adorned with beams and panels of deal skilfully stained to imitate old oak, the steam from a tea-kettle having been made to play over the work as an artistic finish, to remove the natural sheen of the modern but indispensable varnish. The windows, also, Master Georgius has filled partly with the bottoms of bottles and partly with painted glass in small quarries, from his own designs, representing King Arthur and the Knights of the Table Round. The walls he has hung with ancient tapestries, of no great pictorial merit and of doubtful delicacy, but of indisputable authenticity. The floor boards he has stained and varnished like the beams of the ceiling, puttying up the cracks carefully beforehand. The fireplace he has ornamented with a massive chimney-piece of oak, accommodating a dog-stove and irons, unfortunately new, but in excellent keeping with the rest. Of the furniture we need say nothing except that it is very old.

"But one thing which, more than all else, has troubled the mind of this ingenious architect at last, is the fact that the fire, in order to be an authentic fire of the period to which he pretends to belong, ought to burn in the midst of the floor, and not in a hole in the party-wall. To his intense disgust, however, the freehold landlord of the house objects to this, for the vulgar and entirely unartistic reason that it would burn the house down. For some similar reason the surveyor to the insurance office — actually an architect and F. S. A. — objects to it also. The tenant has, moreover, been invited to explain how the smoke would be gotten rid of. Nor has his answer been accepted as satisfactory when he tartly said he would consult the authorities. In these circumstances of difficulty, an ingenious gas-fitter has contrived a manifestation of asbestos, which is to look like a pile of fagots in a condition of incandescence, lying on a sound slab of stone about a yard square, and professional persons have been considering whether this can be allowed by the law. It is the declared intention, moreover, of Mr. Georgius to forswear carpeting for the room, and to go in for strewing the floor with rushes. It is his further intention to go in for occupying the apartment after the ancient manner, by night as well as by day, and in fact to sleep here on the floor between a pair of quilts, with his feet to the fire. 'If a man is a true artist,' he says, 'he ought to go in for it logically.'"

Master Georgius is commissioned to build an abbey, a task in which his soul delights, but as the work goes on he finds some difficulties in the lack of sympathy of the director.

"'Your rooms,' says Monsignore, 'seem to me to be made almost as uncomfortable as they possibly can be.'

"'Why, of course!' exclaims the astonished artist, fixing his glass somewhat indignantly in his eye, 'what you call uncomfortable I call quaint.'

"'Very possibly I should call it the same; but, my dear sir, *cui bono?*'

"'*Cui bono?*' answers the architect, contemptuously; 'that's what all modern people say; that's the horrible mistake of the whole modern world; we shall never recover the tone of the old men till we get rid of such jargon. Now, just for an instance, imagine the fathers of this abbey of ours going in for washhand-basins!' He dropped his eye-glass in sheer dismay at such an idea.

"'Why not?'

"'Why not? I said washhand-basins! and jugs — just think of it!' says the architect, refixing his glass, — 'jugs!'

"'What would you have, Mr. Oldhausen?'

"'A laver, of course.'

"'In what form?'

"'A stone trough, of course, outside the refectory door.'

"'At which gentlemen are to put their heads under the pump, I suppose.'

"'Pump? No! Do you suppose we shall have pumps? They can put their heads into the laver if they want. But I don't agree with much of that; the old men did n't encourage any of that unnecessary affectation.'

"'Soap, I suppose, you would interdict.'

"'Well, soap, you know, ain't architecture; but if I were abbot they should have very little of it, I can tell you.' He drops his eye-glass here with a determined air."

He has convictions on the subject of squinches and slypes: —

"'Then I go in for squinches; they 're structural, certainly; very quaint; the quaintest thing out. I would n't have a corner without a squinch for anything.'

"'Would you not?'

"'No; an architect who does n't use squinches is not an artist at all.'

"'I hope they do no harm, at any rate.'

"Master Georgius drops his glass, scorning to answer a remark so unbecoming; and feeling that he can scarcely threaten, even metaphorically, to punch the head of a Prelatic Chaplain of the Vatican, he changes the subject. 'Perhaps you don't,' he says, 'believe in slypes.'

"'I remember the slype at my college; a narrow, dirty, disagreeable passage-way; is that what you mean?'

"'As for its being narrow, that 's the primary charm of such a thing; and it ought to be crooked if you can get it.'

"'All straight gate, I suppose, and narrow way.'

"'Certainly; and as for being dirty, that depends upon the weather. The word "disagreeable," I can't say that I understand. I call our new streets disagreeable if you like — great, wide, gaping gullets, without a bit of quaintness to be had from end to end; everything seen at such a horrible distance, you know. I would n't allow any street to be more, if I had my way, than about 7 feet wide; and I would have an angle of 45° at least at every 50 feet.'"

And in the matter of a refectory his opinions are very uncompromising.

"'I am going in for doing it inside in red brick, and vaulting it in red brick too, with black diaper patterns all over, you know' —

"'How pretty!'

"'I hope not!' (Dropping his glass.) 'The diapers will be quite irregular, and full of what you would very likely call mistakes' —

"'A sort of intentional accidents, George.'

"'Yes, not a bad term. And then the joints will be all raked out roughly, and the brickwork smeared, you know. I have quite a new idea about that. I mean to go in for letting the workmen have the use of all the rooms, with liberty to smudge them as much as they like, and so at the end we shall have a sort of antique effect, you know.'

"'They will be dirty.'

"'You may call it dirt,' says Georgius, refixing his eye-glass, 'I call it

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Art. And there will be marks here and there, where the fellows have lighted fires, you know.'

"'And caricatures on the walls, I suppose.'

"'Of course. I shall go in for that very much. I shall offer a prize for the quaintest. I 'll have them done with a brush of paint, you know, or scratched with a screwdriver, and so on. I call that real art.'

"'So it is, George.'

"'And smudges of candle-smoke everywhere; and grease, and all that sort of thing. Well, then here's the dormitory; that 's in yellow brick, with white ones and red ones, and so on, intermixed at random. Magnificent!'"

NOTES OF EXPERIENCE AND INEXPERIENCE.

38. Daylight Reflectors and Venetian Blinds. — Can you give me the address of any parties who make "daylight reflectors," and also of parties who make "Venetian blinds." I am informed a firm in Philadelphia make the latter, but my informant could not give names. Perhaps the information might be of as much use to other parties as it would be to C.

NOTES AND CLIPPINGS.

A Fireman's School. — *The Fireman's Journal* states that the Chicago Fire Department School of Instruction is about to be reopened; and, as the scheme on which it is conducted and the course of instruction adopted seem to be admirable, it is to be hoped that all cities in which similar schools are not already established will make haste to profit by Chicago's example. The school is held one day in each week, during the winter months, and has been the means of disseminating much useful information among the members of the department. Following is the programme of instruction marked out for the ensuing year: (1.) Combustible and explosive oils, especially kerosene, gasoline, and that class of hydro-carbons most in use at present; their nature; their use; their danger; how they may be used safely. (2.) Other combustible matter, showing gradual spontaneous combustion. (3.) Explosive compounds. (4.) Causes of fire in paint-shops, drug-stores, warehouses, wooden roofs, asphalt roofs and defective chimneys. (5.) Buildings where steam-power or steam-pipes are used; the danger thereof. (6.) Boiler explosions, the cause, and how to prevent the same. (7.) Lightning as a cause of fire; lightning rods, their construction and utility. (8.) The chemical engine, its principles and use. (9.) Engines, their nature; pumps and vacuum. (10.) Effect of fire upon iron, granite, marble, sandstone, limestone, and brick. (11.) Electricity. (12.) Laws of falling bodies.

The Wear and Tear of Building Materials. — At the tenth annual meeting of the Fire Underwriters' Association of the Northwest, held at Chicago in September last, Mr. A. W. Spalding read a paper on the wear and tear of building materials, and tabulated the result of his investigations in the following form: —

Material in Building.	Frame Dwelling.		Brick Dwelling. (Shingle Roof.)		Frame Store.		Brick Store. (Shingle Roof).	
	Average Life, Years.	Per Cent per Annum Depreciation.	Average Life, Years.	Per Cent per Annum Depreciation.	Average Life, Years.	Per Cent per Annum Depreciation.	Average Life, Years.	Per Cent per Annum Depreciation.
Brick	—	—	75	1¼	—	—	66	1½
Plastering	20	5	80	3¼	16	6	30	3⅓
Painting, outside	5	20	7	14	5	20	6	16
Painting, inside	7	14	7	14	5	20	6	16
Shingles	16	6	16	6	16	6	16	6
Cornice	40	2½	40	2½	30	3⅓	40	2½
Weather-boarding	30	3⅓	—	—	30	3⅓	—	—
Sheathing	50	2	50	2	40	2½	50	2
[1] Flooring	20	5	20	5	13	8	13	8
Doors, complete	30	3⅓	30	3⅓	25	4	30	3⅓
Windows, complete	30	3⅓	30	3⅓	25	4	30	3⅓
Stairs and newel	30	3⅓	30	3⅓	20	5	20	5
Base	40	2½	40	2½	30	3⅓	30	3⅓
Inside blinds	30	3⅓	30	3⅓	30	3⅓	30	3⅓
Building hardware	20	5	20	5	18	8	18	8
Piazzas and porches	20	5	20	5	20	5	20	5
Outside blinds	16	6	16	6	16	6	16	6
Sills and first floor joint	25	4	40	2½	25	4	30	3⅓
Dimension lumber	50	2	75	1⅓	40	2½	66	1½

[1] If carpeted, double the life and reduce depreciation one half.

These figures represent the averages deduced from the replies made by eighty-three competent builders, unconnected with fire insurance companies, in twenty-seven cities and towns of the eleven Western States.

Sculpture in Cincinnati. — Mr. Preston Powers, the son of Hiram Powers, will establish himself in Cincinnati, and will take charge of a school of sculpture, under the auspices of the Art Museum Association. Mr. Powers will remove his studio from Florence to Cincinnati, bringing with him some skilled Italian artisans to instruct the workers in marble.

A Lacustrine Relic. — A singular discovery has been made at Petti Cortaillod, on Lake Neuchatel, which is now so low that the banks in many places are in danger of falling in. The find consists of a single pile or pillar 1 metre 65 centimetres long, of remarkable form and surmounted by a capital, underneath which are bored five holes corresponding with five similar holes at the other extremity. The capital is cone shaped, and the space between the openings has been carefully rounded with an axe. Conjectures as to the purpose for which this object was used are numerous. At first it was taken for a lake-dweller's idol, but the most probable theory is that it served as a tool for the bending of bows, an idea which is derived from the size of the holes and their distance from each other. The instrument, which is attributed by experts to the age of stone and is in a good state of preservation, has been placed in the museum of Boudry.

M. Viollet-le-Duc as an Author. — *The British Architect* states that M. Viollet-le-Duc was the author of twenty-eight works, and had a part in the preparation of five others, besides writing numerous reports, and contributing reviews and papers to various periodicals. The works published by Morel & Cie. are: (1.) Dictionnaire Raisonné de l'Architecture Française du XI. au XVI. Siècle. 10 vols. octavo, with 3,745 illustrations. (2.) Dictionnaire Raisonné du Mobilier, etc. 6 vols. octavo, with 2,145 illustrations. (3.) Entretiens sur l'Architecture. 2 vols. octavo, with 36 atlas plates and sundry woodcuts. (4.) Essai sur l'Architecture Militaire au Moyen-Age, with 153 illustrations. (This is mostly a reprint from the Dictionary.) (5.) Mémoire sur la Défense de Paris. 1 vol. octavo, with 12 woodcuts and 8 quarto plates. (6.) L'Art Russe. 1 vol. octavo, with 129 illustrations. (7.) Modèles de Dessin. (8.) Description du Château de Pierrefonds; (5 editions) illustrated. (9.) Description du Château de Coucy; (5 editions) illustrated. (10.) La Cité de Carcassonne; illustrated. (11.) Lettres sur la Sicile; illustrated. (12.) Lettres adressées d'Allemagne à M. A. Lance, archt. (13.) Ruines de Champlieu. (14.) Intervention de l'État dans l'Enseignement des Beaux-Arts. (15.) Réponse à M. Vitet, dans l'Enseignement des Beaux-Arts. Hetzel & Cie. published the following: (16.) Histoire d'une Maison (7 editions), 1 vol. octavo, with 68 illustrations. (17.) Histoire d'une Forteresse (5 editions), 1 vol. octavo, with 86 illustrations. (18.) Histoire de l'Habitation Humaine from prehistoric times to the present age (5 editions), 1 vol. octavo, with 119 plates. (19.) Histoire d'un Hôtel de Ville et d'une Cathédrale (4 editions), 1 vol. octavo, with 67 illustrations. (20.) Le Siége de Rochepont (a reprint from the History of a Fortress). (21.) Exposé des Faits Relatifs au Musée de Pierrefonds. (22.) Histoire d'un Dessinateur, with 130 illustrations. The works published in collaboration are: (23.) Wagons Composant le Train Impérial, etc. 13 illustrations by Viollet-le-Duc. (24.) Description de Notre-Dame de Paris. 62 plates, from drawings by Viollet-le-Duc. (25.) Cités et Ruines Américaines. (26.) Chapelles de Notre-Dame de Paris. (27.) Habitations Modernes. Besides the above-mentioned volumes, Viollet-le-Duc was the author of Le Massif du Mont Blanc, 1 vol. octavo, with 112 illustrations, and a Carte du Massif du Mont Blanc, both published by Baudry. Ballue published De la Décoration Appliquée aux Edifices (from *l'Art*), and Dumaine published De l'Étude de la Géographie et de la Topographie dans l'Armée; La Fortification passagère dans les Guerres Actuelles, and Un Mot sur les Guerres de Montagnes.

Roman Baths in Perugia. — An interesting archæological discovery has lately been made in Perugia under the direction of Cavaliere Guardabassi, who is Inspector of the Excavations and Monuments for the Government. The remains of what is supposed to have been the Roman public baths in the period of Augustus exist in the garden of the Church of Saint Elizabeth. It is well known that the Roman baths were buildings highly ornamented with sculptured marble, rich cornices, and mosaic pavements, and these are precisely the relics found here at the foot of the hill and near the university. Excavations made to the depth of twenty-one feet revealed a mosaic pavement of white and black stones representing Orpheus calling the animals by his music. This colossal figure is seated in the centre, and before him are a rook, a stag, and a swan; further off a horse and a buffalo, a boar, an aquatic bird, a hare, and a roe. There are also a rhinoceros and an elephant. Not more than the fourth part of this great hall has as yet been disinterred, but the Government will probably purchase the whole ground near and continue the excavations, which it is thought will reveal one of the most important relics of the Roman period. — *Correspondence of the N. Y. Evening Post.*

Excavations at Pergamus. — The excavations undertaken by the Prussian government on the site of Pergamus have resulted in some discoveries of interest. In the lower town fragments of sculpture have been discovered, and on the acropolis is a large hexagonal base of marble, which is thought to have supported a statue of Zeus. On the lower part are emblems of various deities, and on the frieze miniatures of the elements, with their names inscribed above them.

A Valuable Stone. — Professor Forrest Shepherd says that at Old Lyme, Conn., on the estate of the Hon. Charles J. McCurdy, there is a remarkable deposit of Labradorine feldspar, or carnelian granite, sufficient for building the most enduring mansions and costly edifices, or erecting monuments.

The Britannia Tubular Bridge. — It was recently stated in several newspapers that the Britannia Tubular Bridge was rapidly rusting away, and that travellers every time they crossed it were placing themselves very near eternity. Mr. Clark, who has examined the bridge, says that the rust of the whole 10,540 tons of which the bridge consists has not in twenty years amounted to a single pound weight; and he adds that if similar care were continued it was impossible to conceive how any practical deterioration could take place in such a structure even in several centuries. Mr. Clark imagines that the tar and sand with which the cells are internally coated, and which are from time to time cleared out, have been mistaken for rust. — *Van Nostrand's Engineering Magazine.*

Plate-Glass. — Charleroi, a considerable town a short distance from Brussels, is nearly as celebrated for its iron works as Liege, and in the manufacture of plate-glass stands unrivalled. I learned at the American Consulate in this city that glass of the largest size, plates and other descriptions were hitherto exported to the United States in large quantities from the manufactories of Charleroi. But during the last few years this trade has been gradually diminished, until now the exportation has dwindled to zero. On further inquiry I was told at the consulate that the chief cause of this diminution was the manufacture of plate-glass in the United States; that the production of this article had been very great of late, and that the Belgians are beginning to fear that the "quick-witted Americans" will soon be sending plate-glass to sell in the shops of Charleroi. — *Correspondence Cincinnati Gazette.*

Plate-Glass Manufactories. — There are three manufactories in this country where fine plate-glass is manufactured: one at Lenox, Mass., one at New Albany, Ind., and another at Crystal City, Missouri.

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MR. A. C. MARTIN, architect, died in Boston Wednesday, Oct. 29, from the effects of an accident. He was a member of the American Institute of Architects, and one of the founders of the Boston Society of Architects, of which he was for some time secretary. He died in the prime of life, being forty-eight years old, and in the full activity of a successful practice. He was the architect of many buildings in and about Boston, — country and city dwellings, shops and warehouses, hotels, school-houses, and churches. He had in early life, if we are not mistaken, in obedience to his father's requirements, learned a trade; but this was so little to his taste that he soon abandoned it and set out on a sea voyage. Returning from this he went to study engineering at the Scientific School of Harvard University, where he took the degree of S. B. in 1856. He preferred, however, to be an architect rather than an engineer, and entered the office of Mr. Arthur Gilman, who then had a large practice in Boston. The amount of responsibility thrown upon him here, and his own active intelligence, helped him to acquire rapidly a thorough knowledge of an architect's work, so that when he began on his own account his success was more than usually quick. Later he went into partnership with Mr. S. J. F. Thayer. After eight or ten years of busy practice he went to Europe in 1867, where he spent a year in professional study and travel, at which time he dissolved his partnership. Returning to Boston he continued his professional work actively till his death. He was driving home with one of his clients after a professional consultation when an accident occurred at a drawbridge which they were about to cross, and Mr. Martin, getting down from the carriage, was run over by a frightened horse, and received injuries from which he died four or five days after.

HIS scientific bent and his studies in engineering made him a thorough constructor, and led him to give special study to the subject of ventilation of buildings, in which he was an authority among his fellows, while a certain breadth of design and feeling for refinement in treatment and in detail showed that the practical did not overbear the artistic sense. He made some essays on school-house ventilation, which were new, and proved very successful. This probably led to his being called upon to design the large abattoir at Brighton, the first building of its kind in the country; and one of his last works was the building of the new Park Theatre, Boston, in which he ventured on some experimental devices for ventilation which have shown themselves efficient. Mr. Martin was a man of vigorous mind, interested in many studies, and in all the literature of his profession. He was an early contributor to this journal, and wrote a number of papers for different societies and occasions. As a practitioner he was of uncompromising uprightness, with a keen sense of the interests of his clients. It might be said of him more literally, we suspect, than of most architects, that his clients always returned to him. To his personal friends his alert intelligence, his buoyant disposition, the vivacity and kindly sincerity of his intercourse will long remain a pleasant memory.

A SHORT time ago Mr. L. Hallberg, an architect of Chicago, wrote to one of the newspapers of that city to say that some of the brick piers and party-walls of the new Music-Hall now building there were not strong enough for their work, were even now beginning to crumble, and that when the building was finished and full of people there would probably be a terrible accident. The complaint was too serious to be passed over; the building committee who have the hall in charge at once appointed a committee of four experts, Messrs. R. B. Mason, E. S. Chesborough, Max Hjortsberg, and P. B. Wight, to examine the building and its plans, and report whether there was any insecurity either in the plans or in the work. Two of these gentlemen, Messrs. Wight and Hjortsberg, had inspected the plans before the building was begun, and pronounced them safe if certain modifications of construction were adopted. The report of the experts, published in the Chicago papers, sets forth that the modifications recommended by Messrs. Wight and Hjortsberg have been carried out, and that —

"After a careful examination not one of this committee has been able to discover any evidence of crumbling in any of the walls and piers. They have considered every possible contingency that may exist in the future, and have tested the present and ultimate strength of the walls and piers in question by the well-known rules and data which form the authority accepted by architects and engineers. They find the same to be constructed within the limits of safe strength required in such a structure, and are of the opinion that no such calamity as has been predicted is in any way likely to occur.

"The brickwork in question now carries seventy-five per cent of the ultimate load of materials, contents, and human beings packed closely together on every floor, as well as possible accumulations of snow, and gives no evidence of weakness. It now has the strength of freshly built brickwork only, and its actual strength will increase with time as the mortar hardens. The brickwork is superior to the average grade of brickwork in the city. The location of openings in the party-wall, between the main hall and front building, does not weaken the same sufficiently to make it dangerous in any portion, or reduce its aggregate strength below a proper coefficient of safety for such a building."

THE war between church restorers and anti-restorers in England does not cease. We find its progress recorded in a correspondence which has been quoted in recent numbers of the *Architect*. The battle which was waged last year over St. Alban's Abbey was renewed this year over the less conspicuous but famous minster of Southwell, a church with a bold Norman nave and very fine Early English choir, but disfigured, in the eyes of architects at least, by a flat nave roof built after a fire at the beginning of the last century, and by certain plaster choir-screens and cheap pews put in within sixty or seventy years. The church having fallen somewhat into disrepair, the Ecclesiastical Commissioners had been occupied in setting it in order, and, with the advice of their architect, Mr. Christian, had gone so far as to remove and replace the pewing, and to threaten to substitute a high-pitched Gothic roof for that which covers the nave. We have before mentioned the sore quarrel with the anti-restorationists, in which the committee on the St. Alban's church were involved by their resolution to substitute Mr. Scott's proposed high roof for the flat, late mediæval one that existed. The renewal of the roof question at Southwell quickly brought the Society for the Protection of Ancient Buildings to the front, represented by their secretary, Mr. William Morris, who wrote during the last season some earnest remonstrances to the Ecclesiastical Commissioners, and so induced a lingering correspondence about the propriety of the intended restorations. Mr. Morris's letters, which are published in the *Architect*, are of interest, because they show in effect, if not formally, the fundamental postulates of the anti-restorationist party, and the conclusions to which they lead in practice. Without laying down a general doctrine, he protests in turn, apparently, against every alteration which has been undertaken. The flat ceilings of the nave and transepts which would be displaced by the proposed open-timbered roof are assumed to be probably "rude, but still not unsatisfactory, copies of those which were destroyed by fire," and very possibly in the shape of the original roof; the plaster side screens, modelled on the fourteenth-century rood-screen of the church, which has not been removed, as we understand it, were "very interesting," and the pews and choir fittings, "poor though they were, fulfilled the requirements of the service of the church by providing seats for clergy, singers, and people."

To these objections the Commissioners' architect, Mr. Christian, made answer that there was enough evidence in the building to show the steep pitch of the original roof and the level of its collar-beams, and that a new roof following those

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lines would be a great improvement, a point on which Mr. Street, called into consultation by the Commission, seconded the architect, by saying that there could not be two opinions about it. The obvious answer to the defence of the fittings which were removed was that they were unworthy of their position and ought to be supplanted by things which were less so. The upshot of the controversy, so far as appears, was that the Commissioners, having heard the protest of the Society, declined to continue the correspondence, and went on their way as before. The conspicuous thing in the correspondence, and it is characteristic of the whole restoration controversy, is that the parties to it fight each on his own ground, not really venturing on that of the other, so that they hardly meet. The architect decides the question on the ground of artistic effect and the needs of the church service, aiming, with a due reverence for history and archæology, but with little respect for the latest additions, at giving the church what he thinks the best effect. Mr. Street characteristically illustrates his whole doctrine of restoration by the general formula: "The true course is first of all to restore the thirteenth century of the fabric [in idea, that is], then next to see whether a due and good use cannot be made of the building when so restored," and then, if anything is found incompatible with this, "to have the courage to remove the obstruction."

In Mr. Morris's letters, artist though he is, we find but small and perfunctory consideration of the question of art, and we read between all the lines the real doctrine of the Society for the Preservation of Ancient Buildings, — and probably, whether distinctly acknowledged or not, of the whole body of anti-restorationists, — that whatever is is to be preserved, without entering into the question of its excellence or its appropriateness. The strongest accepted argument against restoration is the preservation of the history of art; that of association, though in many cases entitled to consideration, being after all, under most circumstances, purely personal and temporary. But in the history of art some things are important and some are not. It is not to be supposed, for instance, that anybody would ever have used the rude, flat ceiling or the plaster side-screens or thin deal pews of Southwell Minster for serious study. The contest really turns upon the antagonism between the conservatism which opposes every change in what exists, which uses the arguments of history and association as its shield, and which, though not in itself deserving of very much respect, is of great service in the world, like many other rather blind instincts; — and what we call the spirit of progress, which is good in one manifestation and bad in another. An incident of the present strife is that Mr. Street and Mr. Christian, who strenuously opposed the removal of the flat roof of St. Albans, on the ground that it was mediæval and good, though clearly not the original roof, were the architects to recommend the destruction of that at Southwell, as poor and modern. As may be supposed, the irrepressible Sir Edmund Becket, who had energetically championed the new roof at St. Albans, did not fail to put in an appearance in this controversy, not from anxiety to defend a principle, but with a simple pleasure in taunting his old adversaries for being found now on one side of the fence and now on the other.

The persons who have felt an interest in the project to bring Cleopatra's Needle to New York were disquieted a short time ago by the story, which came through London, that the creditors of Egypt had attached the obelisk and would prevent its removal to the United States. The story was officially discredited in this country, and indeed, taking it for granted that the obelisk had been actually transferred to American citizens, as was understood, there was no great reason to think that its removal could be interfered with. The dispatch sent the editor of the *World*, a few days ago, by Lieut.-Commander Gorringe shows that the story was untrue, though not without some foundation. The report sprang, said the dispatch, from an actual attempt by the Italian officials at Alexandria to interrupt the removal, which, however, was set aside promptly by a claim upon the obelisk as American property. Commander Gorringe adds, "There is a great deal of antagonism here on the part of foreign residents to the removal of the obelisk to the United States, and threats have been made of an attempt to seize the obelisk and sell it in Europe for the account of European creditors of Egypt." It is not surprising that the foreign residents should look unfavorably on the abstraction of the Needle; for to take away what has been for ages a famous landmark and has stood in a conspicuous part of the town (now in front of the railway station) where it cannot but be missed, is a very different thing from the removal of its fellow, which had lain unregarded and half buried in the sand at its feet; and in fact it does wear a little the aspect of pillage. The proposal to sell it to Europeans, however, could hardly mend the matter in this respect, and seems to point either to a rather unamiable jealousy, or to a desperate desire to squeeze money out of what was likely to prove a somewhat unmarketable commodity. We may suppose, from what the dispatch tells us, that these attempts are at an end, and that the only risks now in the way are those of shipment and transportation. The shipment itself is likely to be considerably more difficult than that of the fellow obelisk. The other lay conveniently on the sand, ready to be encased and rolled into the water, where it floated in its shell. It is a different matter to take down an upright monolith seventy feet high and stow it safely on shipboard. Hence the necessity for sending out the elaborate apparatus of which we lately quoted the description.

The suits which some farmers of the Sacramento Valley brought to defend themselves against the ruin of their lands by the débris washed down from the gold mines among the hills, as we have described in some former numbers, were decided in their favor by the courts, which ruled that the miners must take care of their washings, or be liable for their injuries to the farmers below. But the evil has grown so widespread with the general adoption of hydraulic mining, the actual and possible injury to cultivable lands so great, that the farmers as a body are anxiously looking for some government intervention which shall so regulate the methods of mining as to protect them. Meanwhile, the actual injury to navigation in the lower part of the Sacramento River is alarming. A speaker at the late Grangers' convention said that in what is called Steamboat Slough, where large vessels could pass only two years ago, there was now but four feet of water. Further up the débris had accumulated to twenty feet in depth. It is also said that a large part of Suisun Bay has been made unnavigable. State legislation is called for, to regulate the operations of the miners and protect the farmers. On the other hand, the question is raised of an appeal to Congress with the hope of inducing it to come forward with money enough to provide the means of protecting the county, by dikes, or sluices, or other appliances, so as to secure the contending interests, without cost to either, against injury from each other.

A correspondent in another column writes to ask us how an architect's standing and relations would be affected if he were to allow one of his sub-contractors to display a sign giving notice that he paid no commissions to architects or agents, and inviting owners to deal with him directly. The effect and significance of such an announcement would depend considerably, we should say, upon where it was displayed. If it were at the contractor's own place of business, as we may take for granted, it would be an announcement of a kind that it is certainly not the custom to put upon sign boards, and one that reflected, by no means flatteringly, on the architects and agents of the neighborhood; but we do not see that the particular architect, for whose work the advertiser held a sub-contract, need consider himself more concerned with it than others, or how he could help allowing it. From the client's point of view one might say that if the first part of the announcement were true the second was unnecessary; and that in that case, if the practice of architects and agents were as dishonorable as the advertiser hinted, he was just the person with whom they might be trusted to make contracts. If it should appear, however, — which we can scarcely believe, — that the sign was displayed at a building which the architect controlled, there would be a temptation to infer either that the architect did not visit his work often enough to be aware of what went on there, or that for some reason or other he was extraordinarily ready to pocket an affront.

THE OPEN FIRE-PLACE. XVII.

According to Bernan, the way in which large buildings or rooms were formerly heated, particularly for manufacturing purposes, where open fires were inadmissible, was by a sort of Dutch stove, formed of a large cast or wrought iron vessel, generally square, and set upon a foundation of brickwork, enclosing the fire, and this apparatus was placed in the room to be heated. But it was found to

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be dangerous, and a large proportion of the accidental fires which in former times destroyed many factories originated with ill-constructed stoves. The air of the room did not move by the heated surface rapidly enough to carry off the heat as fast as it was produced, and the stove was consequently frequently red-hot. This great heat rendered all the adjacent wood-work very combustible, and when the stove cracked, or a joint opened, or any inflammable substance came in contact with it, a conflagration was inevitable. Moreover, close stoves do not assist essentially in promoting ventilation, for the quantity of air withdrawn from the room is only what is needed to support combustion. Morin estimates the ventilation from these to be less than seven cubic meters of air for every kilogram of coal consumed. Indeed, the circulation of air they produce in a room is so sluggish that the temperature of the room varies greatly at different heights. "Ruttan, whose observations were made in Canada, states that in a stove-heated basement room, over a cold cellar, he has frequently seen water freeze on the floor when the temperature of the air at the ceiling was 100°, and has often observed a difference of 4½° (F.) in the temperature of the air for every foot of height in a stove-heated school-room, sixteen feet high, which was exposed on two sides to outside air at 0°."[1] But if a casing is arranged around a stove, with a space left between it and the stove open below and above, the column of air within the casing will be doubly heated by contact on one side with the stove and on the other with the casing. Being protected from the cooling influence of the surrounding air it will rise rapidly and produce a circulation in the room which will equalize its temperature.

The next step was to put the stove in a chamber by itself, adjoining or below the room to be heated. The external air was admitted into this chamber, warmed, and conducted by flues about the building, and the whole formed a hot-air furnace. A large amount of fresh air is brought by the casing in contact with the heating surfaces, and it strikes them forcibly on account of the strong current produced by the hot-air flues. The fresh air is generally taken from the outside, and it is in this respect, as well as in the principle of the circulation produced by the casing, that the furnace is superior to the close stove, while in the loss of the advantage of direct radiation from the sides of the heater it stands inferior to it.

The most important point to be considered in the construction of all basement furnaces alike, is the acquisition of a good chimney draught, because of whatever material or in whatever manner they may be made, they cannot be rendered absolutely gas-tight. Even though the materials be non-porous and the joints be tight, the very openings required to admit fuel to the fire or air to the fuel may, under a back pressure, also emit gas. Where these openings are out of sight and immediate control of the occupants, the noxious gases, often imperceptible to the senses, may enter the house without their knowledge; and this is the most prevalent cause of trouble with the hot-air furnace as it is now constructed. It is, therefore, of the first importance with these that the draught of the smoke-flue should exceed in strength that of the hot-air circulation pipes, whose powerful action is shown by the force with which the warm air issues from the registers. The hot-air flues in a basement furnace being frequently nearly as long as the smoke-flue, and the maximum utilization of the heat of the fuel, or of its smoke, being considered the grand desideratum, these hot-air flues become hotter than the smoke-flue. The column of air in the former being, therefore, lighter than that in the latter, the smoke or gases will rush into the fresh-air flues through any crack or joint connecting the two columns together, or they will enter the house through the feed and draught doors.

The above difficulties might, however, be obviated, and absolute safety against the escape of gas be obtained, together with a complete utilization of the heat of the smoke, by bringing distinct currents of fresh air simultaneously against the heating surfaces of the furnace at various points of these surfaces, properly located with reference to each other and entirely separated from each other. By this means a good draught might be obtained at all times, and yet the temperature of the smoke-flue be reduced to very nearly that of the outside air.

Let Fig. 129 represent a furnace (devised by the writer) constructed after this principle. The fresh air enters the furnace at A, B, and C, simultaneously, but into heating chambers entirely separated from each other, say at points corresponding with each floor of the house. The hot-air flues start at A′, B′, and C′. The outer air entering the first chamber might lower the smoke, say, from 300° to 150°, and be itself raised from 0° to 10°. A second current of fresh air at B, entering the second chamber or division of the furnace, might further cool the smoke to 75°, and be itself raised from 0° to 40°; and, finally, a third supply at C, entering the third chamber, might, by taking a direction the reverse to that of the smoke, reduce the latter to or very near to 0°, and itself be raised to 40°. The average temperature of the smoke in the chimney would, though entirely cooled at the top, be

$$\frac{300+150}{2}+\frac{150+75}{2}+\frac{75+0}{2}=225+112.5+37.5=125°.$$

This would be much higher and the velocity correspondingly greater than that in any fresh-air flue, so that the chimney draught would be good, even if the fresh-air flues were maintained at 40° or 50° throughout their entire length, and this length were equal to that of the smoke-flue. In a furnace constructed in the manner described, however, each compartment of the furnace would have only its own floor to warm, and the air flues would have little or no perpendicular extension beyond what would be required to create in them the necessary draught. The temperature, therefore, of the fresh-air column would practically be that of the house, say 20°, and its length only the distance from its commencement at A′, B′, and C′, to the ventilator D, on the roof, and consequently always less than that of the smoke-flue.

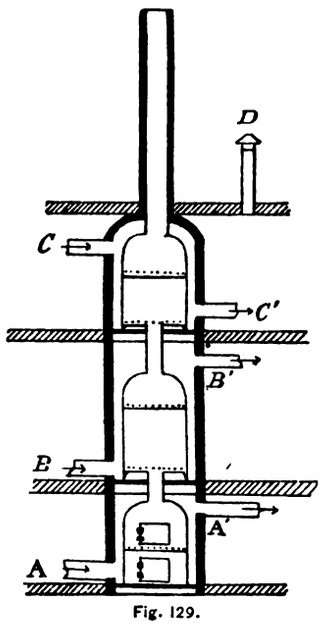

Fig. 129.

Inasmuch as the diffusion of gases will take place even in opposition to a considerable current of air, no porous material is suitable, under any circumstances, for the construction of a furnace, since the porosity not only permits an escape of gas at all times, but also serves as a connection between the hot-air and smoke columns in cases of back draught. The joints should be made in such a manner that the contraction and expansion of the materials cannot work them loose, however long the furnace be in service.

Where metal is used, its kind or thickness has but little effect, within ordinary limits, upon its heating power; for the quantity of heat which can be conducted through the thickness of metal usually employed is much greater than can be carried away by contact of air. But for greater thicknesses the amount transmitted by small pipes increases with the thickness. A cast-iron pipe one decimeter in internal diameter, heated on the inside to 100° and exposed to the air at 15°, with different thicknesses of metal, would lose heat per meter and per hour as follows: The thickness being nothing, or infinitely small, the loss would be 254 units; for thickness of 2.5, 5, 10, and 15 centimeters the loss would be respectively, 363, 472, 676, and 848 units, or in the ratios of 1.4, 1.8, 2.6, and 3.3 to 1 respectively. Where stone, brick, or terra-cotta pipes are used, whose conductibilities are much smaller than that of iron, say as 15 and 4 to 250, the variation for great thicknesses is much smaller. The reason of this is that the increase of thickness increases the radiating surface of the exterior, so that while each square meter of such surface gives out less heat than a square meter of the surface of the thin pipe, in the proportion of 0.95, 0.92, 0.89, and 0.85 to 1, for the cast-iron pipe one decimeter in diameter, of the thicknesses mentioned above, yet the surfaces are greater in the proportion of 1.5, 2, 3, and 4 to 1. Thus, thickening the heating or radiating flues of a furnace made of good heat-conducting materials increases their effectiveness just as do ribs or spikes cast upon the radiating surface, by increasing its superficial area. Indeed, unless the ribs are properly placed, a simple thickening of the pipe is sometimes even more effective. Thus a threaded pipe, 1 centimeter thick, 18 centimeters in diameter, and 10 meters long, threading 0.5 centimeter deep, standing vertically, was tested by the writer, and found to yield less heat than a smooth pipe 1 centimeter thick, and of the same diameter and height, although the actual radiating surface was twice as great on the threaded as on the smooth pipe. The threading being perpendicular to the direction of the air current, it lost more than half of its effectiveness in heating the air by convection, owing to the fact that the ascending air current struck only the lower outside edge of each thread, while the loss by radiation remained the same, because, though the radiating surface was twice as large, yet half the rays fell upon the surfaces of the threads themselves, and were by them reabsorbed.

It is a mistake to suppose that furnace heat is *necessarily* dry and unhealthy. Where the heating surface is raised to a high temperature the vegetable and animal matters, which are always to be found, to a greater or less degree, floating in the air, and can easily be seen under a ray of sunlight, come in contact with an over-heated surface, they are roasted or burned, and emit an unpleasant odor. When these surfaces become red-hot they may decompose the air itself, forming, with the iron, acid gases injurious to the health, or gases may pass through the furnace, as already stated; but so far as depriving the air of its moisture is concerned, by which a too rapid evaporation from the skin is induced, causing headache and unpleasant sensations of the nose and throat, the same effect is produced by steam or hot-water pipes and by every other method of heating, when the temperature of the outer air is warmed to the same degree. Cold air, when expanded by heat, has a greater capacity for moisture in proportion to the extent of the expansion. In the open fields this needed moisture is supplied by nature through the agency of rivers and lakes. In our houses, where rivers and lakes do not form themselves naturally about our hot-air furnaces (unless the unskilful plumber has opened for them sources in the drain and

[1] Johnson's Universal Cyclopædia.

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water pipes), their places should be supplied by art in the form of evaporating-pans, and the disagreeable sensations arising from dryness will quickly disappear.

THE RECOLLECTIONS OF SIR GILBERT SCOTT.[1] II.

The Hamburg competition made Scott a famous man. It was undoubtedly of great advantage to him in other ways than merely extending his reputation. It took him out of the ruts of a more or less local practice and local associations, and broadened his mind by contact with a fresh circle of men of another nation and other habits of thought, and by the study of a nobler architecture than he had as yet known. For in those days photography was undiscovered, and, as we have already said, his first journey into foreign parts was made as a preparation for this competition. But once having realized that the world was larger than England, he felt it to be worth his while to extend his knowledge of Continental architecture. From this time he was in Germany nearly every year, and two years later, in 1847, he went to France, and in 1851 to Italy, where, however, he allowed himself no more than a hasty run through the chief northern cities. His French travel was the result of his appointment as architect of the restoration and refitting of Ely Cathedral, the first of the great churches upon which perhaps his best work was done, and the work in which he took the greatest pleasure. "It was," he says, "from the excitement produced in my mind by Dean Peacock's description of Amiens Cathedral, which he had visited that autumn, that I was led as late as the end of November to make a short run over to France, chiefly to Amiens and Paris. My eyes were at once opened. What I had always conceived to be German architecture, I now found to be French. I thoroughly studied the details of Amiens and those of the Sainte Chapelle, which bore most closely on my previous German studies, and I returned home with a wholly new set of ideas and with many of my old ones dispelled. It seems curious that I should have been twelve years in practice before I became acquainted with French architecture, yet I was the first among English architects, as I believe, to study it in detail in any practical way and with a practical intention."

The Italian cities threw him into a state of great excitement, and his account of the journey is as full of enthusiasm as the journal of a gushing youth on his first travels, though he had now "come to forty year." He was, however, convinced after all that Italian Gothic as such must not be used in England, but equally convinced "that the study of it was necessary to the perfecting of our revival." From this time his designs for civic buildings were strongly influenced by Italian feeling. His churches do not, as we remember them, show this influence in any marked degree.

In 1856 the whole profession in England was set at work by the competition for the Government Offices. Scott was then occupying his hours of leisure, which were for the most the hours spent on the road, in writing his book on Domestic Architecture, in which he has stated at length the argument for the revival of the Gothic style, and the principles which guided him in his own practice. He considered himself, therefore, to be in a certain sense prepared for this portentous struggle. He considered it wise, however, to give himself some special training for it, of which his account is curious.

"Long before the programme came out, I set to work to put myself systematically through my facings. My family being, as was usual in the latter part of summer, in the Isle of Wight, I retired to a great extent from active engagements, and set myself to design the elements which I thought most suitable to a public building. I designed windows suited to all positions, and of all varieties of size, form, and grouping; doorways, cornices, parapets, and imaginary combinations of all these, carefully studying to make them all thoroughly practical and suited to this class of building. I did not aim at making my style Italian Gothic, my ideas ran much more upon the French, to which, for some years, I had devoted my chief study. I did, however, aim at gathering a few hints from Italy, such as the pillar-mullion, the use of differently colored materials, and of inlaying. I also aimed at another thing which people consider Italian, — I mean a certain squareness and horizontality of outline. This I consider preëminently suited to the street front of a public building. I combined this, however, with gables, high-pitched roofs, and dormers.

"My opinion is that, putting aside the question now rife, as to whether we should or should not introduce foreign varieties of Gothic, my details were excellent, and precisely suited to the purpose. I do not think the entire design so good as its elementary parts. It was rather set and formal. With all its faults, however, it would have been a noble structure, and the set of drawings was perhaps the best ever sent in to a competition, or nearly so.

"A little before the competition, but subsequent to my designing the speculative elements of it, I had a good opportunity of trying these elements beforehand. Mr. Akroyd had asked me to design a town-hall for Halifax to suit a site which he favored. I made a design which I flatter myself was as good a thing of its kind, and of its small size, as had been made at the time, nor do I think I could now do better. It was the first-fruits of my design for the Government Offices, and, in my opinion, was better than any subsequent design for these buildings."

The designs were sent in in the autumn of 1856. The judges, "who knew amazingly little about their subject," were long in making up their award of the premiums, which were divided into two groups, five for the Foreign Office and five for the War Office. Scott was awarded the third prize for the Foreign Office, the first being awarded to Messrs. Coe & Hofland, of whom Mr. Coe was Scott's old pupil; and the second to Banks & Barry. Both of these designs were in the classic style; Scott was apparently prepared to accept his defeat, until it was discovered that Lord Palmerston, then premier, had set aside this verdict, and was about to appoint Mr. Pennethorne, who had not competed at all, to the position of architect of both the War and Foreign Office, when Scott felt at liberty to stir. "A meeting took place at Mr. Beresford Hope's, at which Charles Barry, myself, and Digby Wyatt were present; and, if I remember rightly, it was agreed to stir up the Institute of Architects. To the best of my memory, the Government had just changed, and Lord John Manners had taken the Office of Works, when a deputation from the Institute laid the matter before him. The result was the appointment of a select committee to inquire into the subject." This committee took the evidence of the assessors or experts, who had advised the judges as to the merits of the various designs; and at length, stating their conclusion as to the rival styles, to the effect that they were "equal in convenience and cost," they virtually recommended the Commissioner of Works to make his own choice between the Gothic design of Scott and the Renaissance design of Banks & Barry. The committee's report was made in July, but no decision was reached until late in November, when it was given in favor of Mr. Scott's design for the Foreign Office. The War Office in the mean time had been abandoned, and an India Office was to be built instead. Lord Stanley, Secretary of State for India, had drawn up a memorandum for the appointment of Mr. Scott to this building, in connection with the foreign department. But Mr. Digby Wyatt, then the official architect to the India Office, called upon Scott and proposed joining forces. Scott assented, the plans were drawn and accepted, and the working-drawings for both buildings well under way, when Mr. Tite, the architect of the new Royal Exchange, at that time a member of Parliament, made a violent attack upon the designs in his place in the House of Commons. Lord Palmerston supported him in another speech, and the battle was begun which was to rage unabated for more than two years. Scott replied to the attacks in Parliament by a letter in the *Times*, which only provoked a second attack, and was considered by certain architects to reflect upon the profession to such an extent that it was proposed that the Institute of Architects should refuse him the gold medal which the council had recommended. This insult was avoided by strong remonstrances on the part of Scott's friends, but Scott and his design were now understood to be the proper mark for any arrows of contempt and abuse which any ill-natured person, professional or other, might have to throw. He had, however, still some good friends in Parliament, and Lord John Manners, the Commissioner of Works, stood manfully by him. So they went on with the working-drawings, though doubtless in great distress of mind, as not knowing how soon they might all be found useless. All of a sudden there was a dissolution, a new election, and behold my Lord Palmerston in power again, with a new Commissioner of Works of his own choosing. Then came a bad season for the much-injured architect. "I forget," he says, "the precise order of events, but the builders' estimates were by that time in a forward state, and were allowed to come in, and they turned out very satisfactorily. Lord Palmerston, however, sent for me, and told me in a jaunty way that he could have nothing to do with this Gothic style, and that though he did not want to disturb my appointment, he must insist on my making a design in the Italian style, which he felt I could do quite as well as the other. That he heard I was tremendously successful in the Gothic style, but if he let me alone, I should Gothicize the whole country, etc., etc."

In the mean time the quarrel had spread. On the one hand a deputation of M. P.'s waited on Palmerston to argue in favor of the Gothic style. On the other hand, a deputation of architects waited on Palmerston to encourage him in his resistance to this encroaching barbarism, Sydney Smirke, one of the deputation, declaring that "if they began with Gothic in King Street, it would never stop till it reached Charing Cross." Scott tried to get up a counter address, but could find only a faithful few among the architects willing to commit themselves so far as to sign it.

Shortly afterwards "Lord Palmerston sent for me, and, seating himself down before me in the most easy, fatherly way, said, 'I want to talk to you quietly, Mr. Scott, about this business. I have been thinking a great deal about it, and I really think there was much force in what your friends said.' I was delighted at his supposed conversion. 'I really do think there is a degree of inconsistency in compelling a Gothic architect to erect a classic building; and so I have been thinking of appointing you a coadjutor, who would, in fact, make the design!' I was thrown to the earth again. I began at once to bring arguments against the proposal, but the blow was too sudden to allow me to do justice to my case *viva voce*, so on my return I immediately wrote a strong and firmly worded letter, stating that I had been regularly appointed to the work; that Mr. Gladstone had assured me that my appointment would be respected; that he,

[1] *Personal and Professional Recollections by the late Sir George Gilbert Scott, R. A.* Edited by his son, G. Gilbert Scott, F. S. A., etc., etc. London. 1879.

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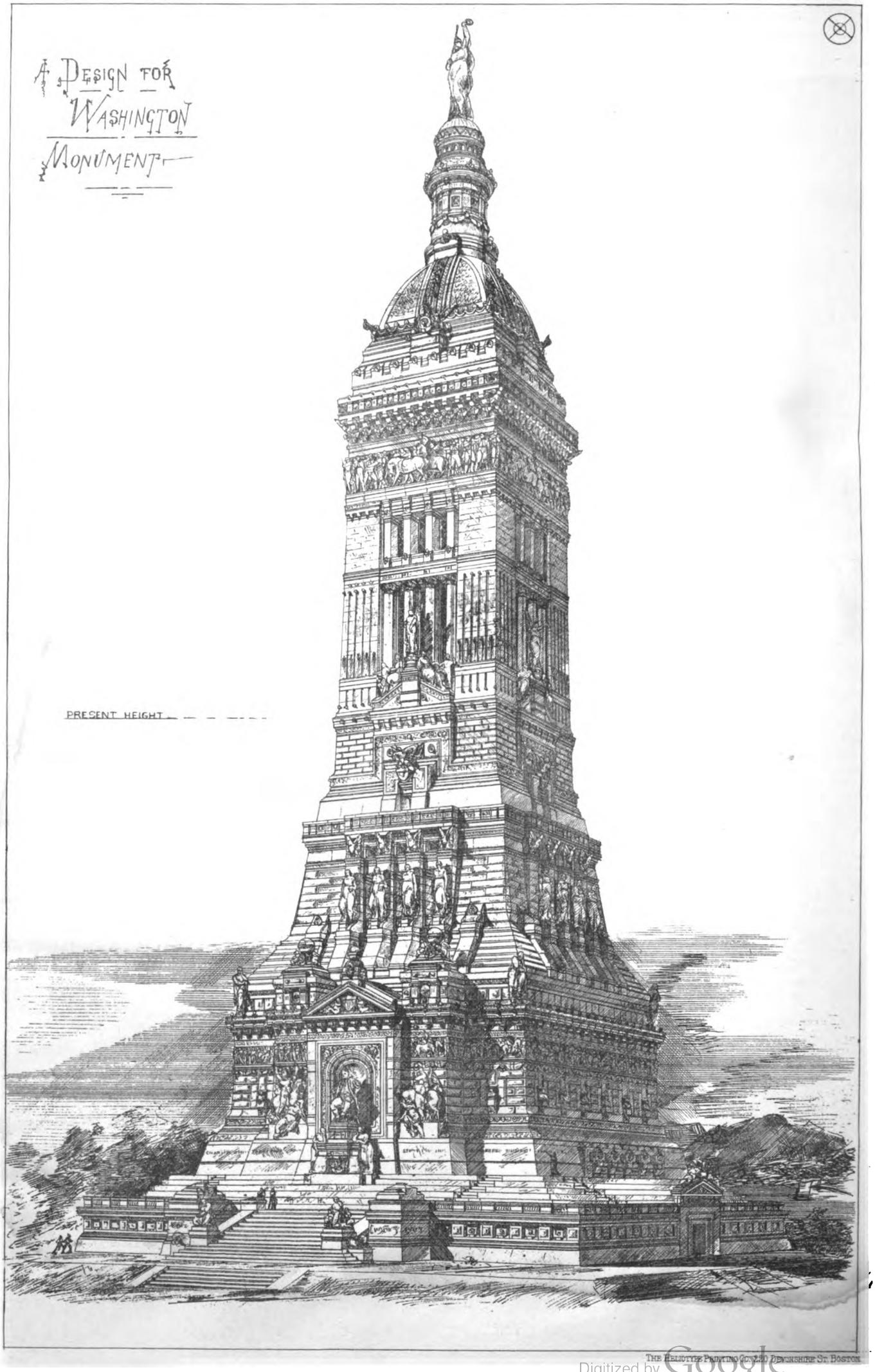

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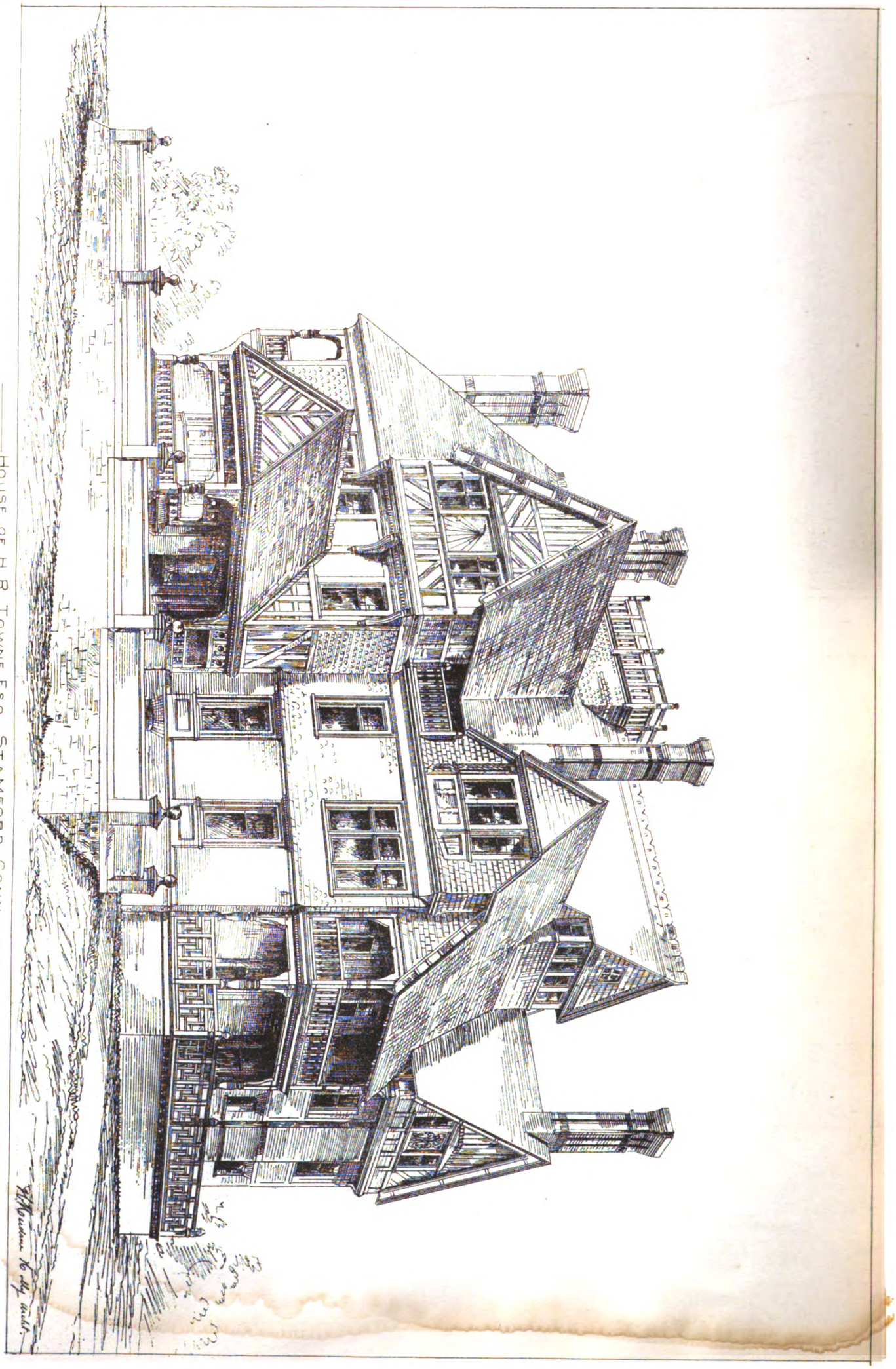

HOUSE OF H R TOWNE ESQ. STAMFORD, CONN.

H.H.HOLLY ARCHT.

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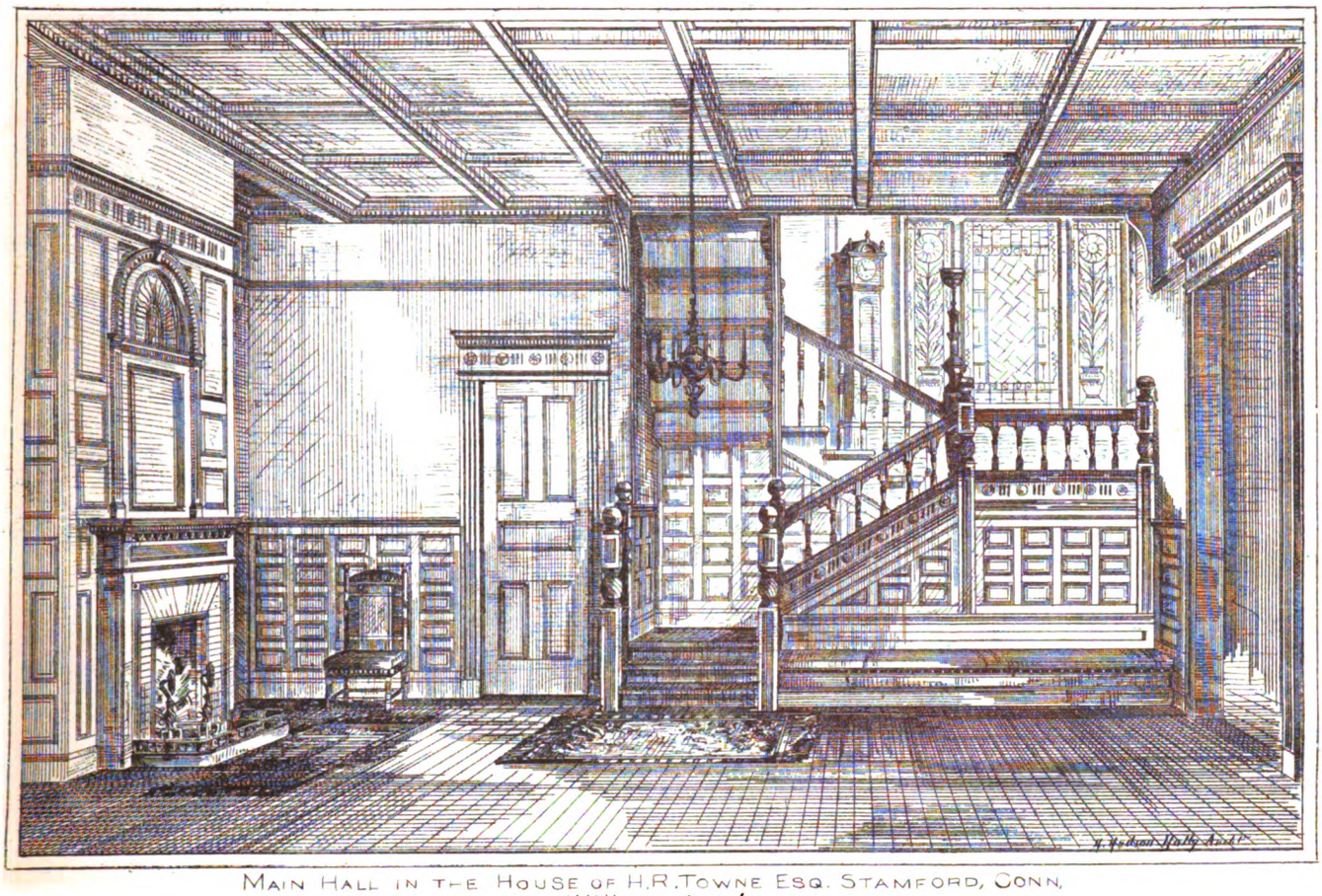
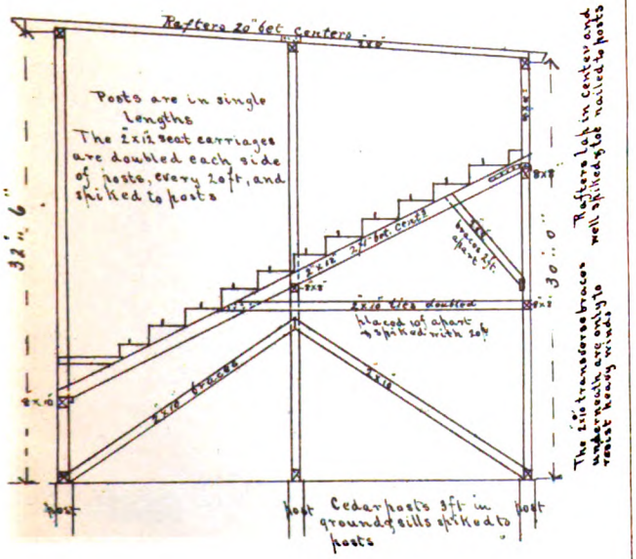
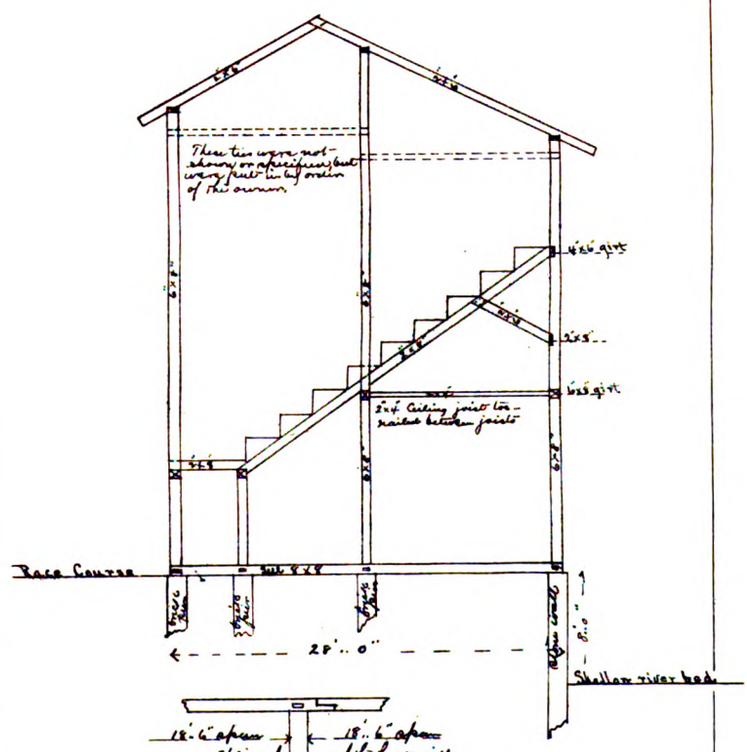


MAIN HALL IN THE HOUSE OF H.R. TOWNE ESQ. STAMFORD, CONN.
H.H. HOLLY ARCH'T.


Rafters 20" bet. Centers
Posts are in single lengths
The 2x12 seat carriages are doubled each side of posts, every 20ft, and spiked to posts
32'..6"
30'..0"
2x12 tie doubled
2x12 braces
Rafters 2ft in center and well spiked & bolted to posts
The 1x6 transverse braces underneath are only to resist heavy winds
Cedar posts 9ft in ground & sills spiked to posts
post

All timbers mortised & tenoned & braced. Braces kinned in & nailed
Seat carriages 2x12 reston girts
& toe nailed & anchored with iron anchors

Section of Toledo Grand Stand
Size 34 x 400 ft.


These ties were not shown or specified but are put in by order of the owner.
4"x6" girt
2"x8"
2"x6" Ceiling joist to be nailed between joists
Race Course
8'..0"
20'..0"
Shallow river bed
18'..6" apart
18'..6" apart
Splice of one of the front sills

Seat stringers 16" apart, butt against rear girt & toe nailed
No transverse ties to building. Sills framed & spiked together.
"Posts toe-nailed to sills & girders" (language of specification)
No provision for receiving girts or ginders, as they were all cut off square & toe nailed into posts
Front posts 20 ft. bet. centers. Rear posts 16 ft. bet. centers

The Grand Stand at Adrian Mich.

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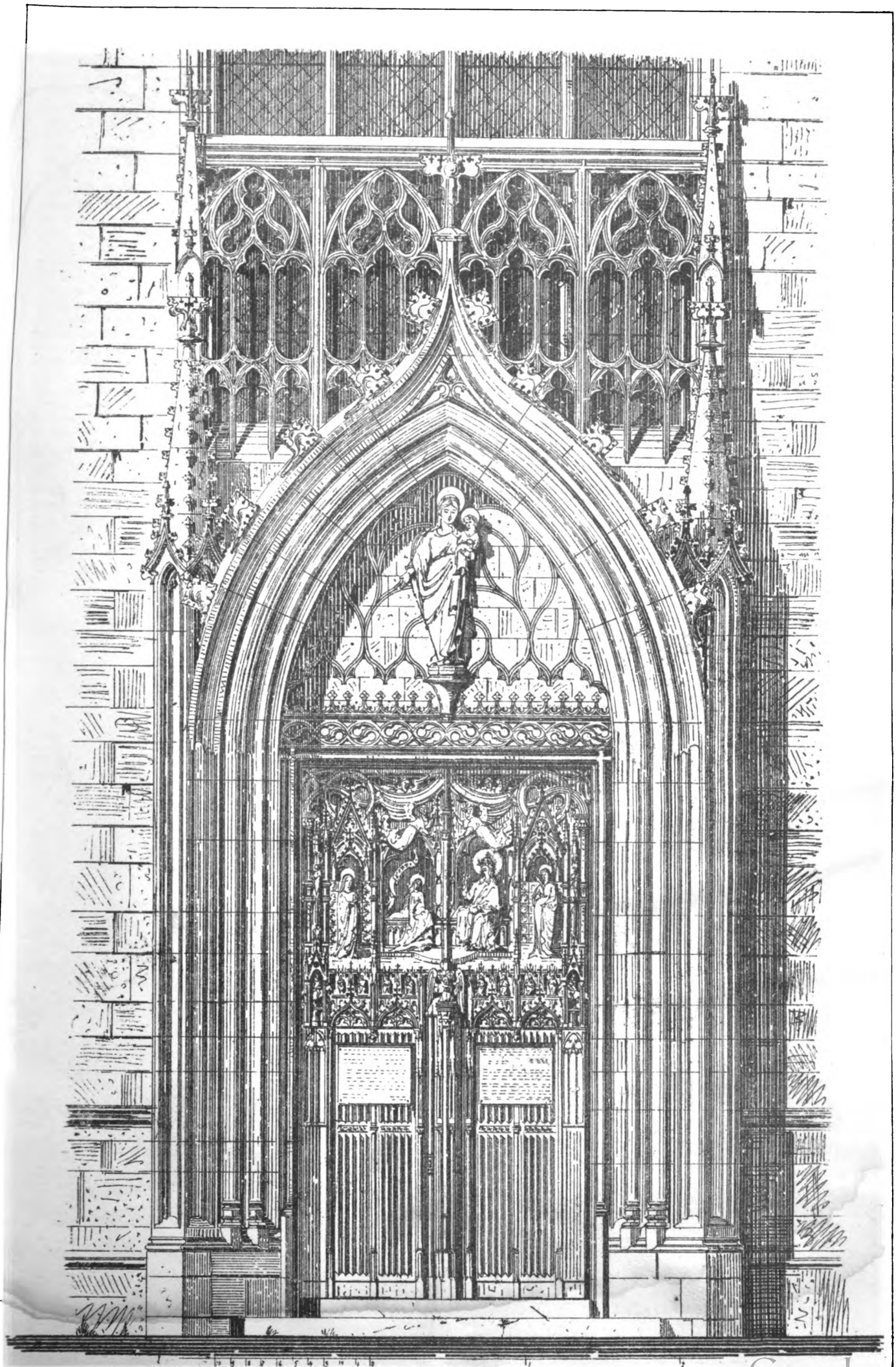

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NORTHERN DOORWAY OF ST. LAMBERT'S CHURCH [illegible], WESTPHALIA.

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Lord Palmerston, had done the same, both personally and in Parliament. I dwelt on my position as an architect, my having won two European competitions, my being an A. R. A., a gold-medalist of the Institute, a lecturer on architecture at the Royal Academy, etc., and I ended by firmly declining any such arrangement. I forget whether he replied." Poor Scott now began to consider whether it might not be possible to compromise by making an alternative design which should pass muster with Palmerston as classic, while really avoiding the characteristic features of that style. So he made a sort of modified Byzantine design, which his friends approved, and showed it to the Commissioner of Works, who promised to make an appointment for him to meet Palmerston. The appointment was made and Scott kept it, but Palmerston did not. Instead, "he kept me waiting for two hours and a half in his back room (during a part of which I heard him very deliberately going through his luncheon in the next room), and then sent me away unseen." The design was finally got before the impracticable minister, and Scott thought he liked it but did not like to say so. More delay, in the midst of which he heard, "by a side wind," that one of the unsuccessful competitors had made a new design, which was actually under consideration at the Office of Works, whereupon Scott drew up a formal statement, recounting the history of this ignoble affair, so far, and protesting strongly against the course secretly taken by the Government. This protest was sent to the Commissioner of Works, and Scott's friends in the House of Commons were informed of what had been done. This step proved effective, and the new move of the Government was defeated. Scott was now directed to make certain changes in his semi-Byzantine design, to bring it more into harmony with the views of the Government. The design thus altered was submitted to the joint opinion of three architects, Messrs. Cockerell, Burn, and Ferguson, who made a joint report, recommending its acceptance, subject to a few additional modifications. Thus modified, it went again before Parliament, "which had no liking for it, but let it pass," being presumably tired of the affair. Not so Palmerston, however, who now ceased fencing and followed Dr. Johnson's example: "If his pistol misses fire, he knocks his adversary down with the butt." On the 8th of September, 1860, he sent for Mr. Scott, "when he told me that he did not wish to disturb my position, but that he would have nothing to do with Gothic, and as to the style of my recent design, it was 'neither one thing nor t'other, a regular mongrel affair, and he would have nothing to do with it either;' that he must insist on my making a design in the ordinary Italian, and that though he had no wish to displace me, he nevertheless, if I refused, must cancel my appointment. He did not stop for a reply, but went on to tell me that he had made an arrangement with Sir Charles Wood, which necessitated an entire change of plan," etc.

Further resistance was useless. Scott's friends counselled submission, and he submitted. A new design was prepared, in the classic Italian, with which we are familiar. "And thus," he says, "after more than two years' hard fighting, I was compelled to 'eat my leek.'"

The result was mortifying enough, but one can only smile at the abject humiliation and shame with which poor Scott felt himself to be overwhelmed. He had made a gallant fight, and the Philistines, as might be expected, had proved too strong for him, but the defeat was not one to be ashamed of, and the repeated apologies which he offers, for yielding to the Government in carrying out the buildings in the style which they prescribed, show the extent to which his mind had become penetrated by the ethics of Ruskin and Pugin. "My shame and sorrow were for a time extreme, but to my surprise the public seemed to understand my position and to feel it, and I never experience any annoying or painful rebuke, and even Mr. Ruskin told me that I had done quite right."

THE ILLUSTRATIONS.

A DESIGN FOR THE WASHINGTON MONUMENT AT WASHINGTON, D. C.

THE legend which is submitted with this design states that the stones which fill the panels in the terrace wall below the balustrade are to be presented by the different States and Territories, while the stones which have been similarly presented by foreign countries find their places as ornaments to the battering plinth of the pedestal. The figure of Washington is seated on a pedestal in front of a niche, and is supported on either hand by statues of Truth and Industry, while larger groups representing Peace and War find a place on either side of the niche. The busts in front of the panels in the die of the pedestal represent the heroes and statesmen of the Revolution. A Procession of Industry in bas-relief serves as frieze to this portion of the monument. The four statues at the angles of this entablature represent Liberty, Justice, Education, and Suffrage. The thirteen original States are represented by the engaged statues which mark the second stage of the structure. The statues surmounting the pediments midway of the main shaft typify the four sections of the country, North, East, South, and West. The Army, in bas-relief, surrounds the shaft as a freize. The figure of America surmounts the whole monument, which is designed to be three hundred and thirty feet high. The present height of the uncompleted shaft reaches only to the cornice line of the pediments which support the figures, North, South, etc.

HOUSE FOR HENRY R. TOWNE, ESQ., STAMFORD, CONN. MR. H. HUDSON HOLLY, ARCHITECT, NEW YORK, N. Y.

INTERIOR VIEW OF THE MAIN HALL OF THE SAME.

SECTIONS SHOWING THE CONSTRUCTION OF THE GRAND STANDS AT TOLEDO, O., AND AT ADRIAN, MICH.

See communication in another column.

DOORWAY OF ST. LAMBERT'S CHURCH, MUNSTER, WESTPHALIA.

We here reproduce one of the doors of the Church of St. Lambert, which, like the other views of portions of the same building which we have published, is copied from the *Allgemeine Bauzeitung*.

CORRESPONDENCE.

NEW BUILDINGS. — THE FRUIT AND VEGETABLE MARKET. — THE PROPOSED COLONIAL MUSEUM.

LONDON, October 16, 1879.

THE "dull season" is coming to an end and most people are back at their work again. Work, however, in an architectural sense, still suffers from the effects of the general depression, though there are signs of improvement in several quarters. A few large buildings recently decided by competition, such as the City of London Schools, the Greenock Municipal Buildings, the Over Darwen Town-Hall and Markets, the Wesleyan College at Birmingham, etc., will presently be carried out, besides smaller works, and others already in hand, so that the prospect is, on the whole, better than it was last year at this time. The recent revival of the iron trade in the north will also have a beneficial effect on building in that quarter, in connection with which may be mentioned the acceptance of the contracts for the new railway bridge across the Forth, at Queensferry. A Sheffield firm has obtained the contract, at £700,000, for the steel and iron work; and a Glasgow firm, for £300,000, that for the masonry, etc. The bridge, which is being built from the designs of Sir Thos. Bouch, the engineer of the Tay bridge, will be one of the largest and most important engineering works in the world, and, as the contracts show, will cost over £1,000,000 sterling. When finished it will be the great connecting link between the railways north and south of the Forth. Here in London the public buildings make steady progress. The Natural History Museum at Kensington is just about completed, and another portion of the Law Courts is to be ready for occupation at the beginning of the November Term. The contract has also been accepted, at £109,000, for the new Fruit and Vegetable Market at Smithfield. This is the third large market at the same place, and, like the other two, is from the designs of Mr. Horace Jones, the city architect.

In general architectural character the new market will resemble the others, the style being a free treatment of classic, in red brick, with stone pilasters, cornices, etc. The principal difference is in the planning, the new building being what is termed an "open" market, that is, a large central area, with shops facing the surrounding thoroughfares, as well as this central space. The general area of the market is about 44,000 square feet, of which about 17,000 square feet are occupied by some 40 "outside" shops, while inside there will be 33 shops, each having in front a "pitching stand" for goods and wagons. In the centre of the market area will be a space of 4,400 square feet, available for independent pitching stands, covered by a roof 70 feet high at the centre, 45 feet to the ridge, and 28 feet to the plate, supported on only 16 columns, so as to leave the area as clear as possible. The basement will be devoted to storage purposes, and to the railway lines of the Chatham and Dover Company, so that fruit and vegetables may be brought direct from every railway in the country. The great success which has resulted from the central markets scheme, so far, leaves little doubt as to the future of the new addition from a financial point of view, while architecturally the new market will complete the occupation of nearly all the space created by the Holborn Valley Improvement Scheme of the corporation.

We expected ere this to be able to chronicle some definite progress in the scheme for converting the unfinished National Opera House on the Thames Embankment into a Colonial Museum. As this seemed to be the most hopeful, and for the general public the most important, of all the proposals for utilizing this unlucky building and its magnificent site, it will be a matter of the greatest regret if it is allowed to fall through from want of support. From the elaborate statement prepared by the promoters at home, and sent to the various colonial governments for their consideration, a few of the details may prove interesting. It is calculated that the freehold of the site, together with that of four houses in the rear, can be had for £88,000, and this, it was proposed, should be provided by the mother country. An arrangement was entered into to purchase the unfinished building from the Opera House Company for the sum of £40,000, though it seems that no less a sum than £65,000 has been spent on it. Plans were prepared by Mr. F. H. Fowler, the architect of the Opera House, showing how the entire building could be adapted for the purposes of a Colonial Museum, providing ample exhibition space for the different colonies, with library, reading, and lecturing rooms, as well as offices for the various agents-general, at a cost of £135,000, which includes a sum of £10,000 for water, heating, and lighting, and full provision for all incidental expenses.

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This, with the £40,000 to be paid for the existing buildings, would bring the cost of the structure to £175,000. In addition to this, however, it is estimated a further sum of £10,000 will be required for the fittings and arrangement of the various portions, which would bring the total amount up to £185,000. To keep on the safe side, and to avoid the necessity of supplementary grants, it was thought prudent to adopt the sum of £200,000 as a basis for calculation, and this, it was proposed, should be provided for by the colonies according to a carefully prepared scale of the probable space required by each.

From the plans prepared by Mr. Fowler the general arrangement appears to consist of a large central hall 225 feet long by 102 feet broad, with two tiers of galleries. On one side there will be three floors of independent exhibition rooms, communicating with the central hall, and on the other a block of six groups of offices, each with its separate entrance, and its direct access to the museum. The floor space provided for exhibition purposes amounts to 70,000 square feet, which is subdivided into a series of sections for each of the great colonies or groups of colonies. In the basement is a large lecture-hall for 1,000 persons, a smaller hall for 350 persons, library, reading-room, the necessary offices, committee-rooms, storage, retiring-rooms, etc., giving an additional 15,000 square feet, while the block of offices available for the agents-general give 19,000 square feet more. The main entrance would be from the Victoria Embankment, and another entrance hardly less important from Derby Street, which is only some 30 yards distant from Parliament Street. In architectural treatment the elevation to the embankment is a repeat of the façade of the Opera House, with the addition of a pediment filled with sculpture in the centre, while, of course, the high rectangular mass which marked the stage and the semicircular roof which covered the auditorium are omitted. The colonnade in front of the entrance hall remains as before, and the crush-room on the first floor appears to be devoted to the island of Ceylon. The circular angles, a feature in the Opera House plan, are retained, and seem devoted to cloak-rooms on the ground floor, and Ceylon, Malta, Gibraltar, etc., on the first floor. Considerable ingenuity has been shown by Mr. Fowler in adapting the present building, so far as it goes, to the altered purposes, and from its ample space, no less than its central position, the scheme seems an admirable one.

In regard to its management, following the precedent of the British Museum, it is suggested this should be vested in a body of trustees constituted as follows: The Crown agents and the agents-general of the various colonies as representing the colonies, with the Secretary of State and the permanent Under Secretary for the Colonies, the Lord-President of the Council of Education, the Lord-Mayor of London, the Chairman of the Metropolitan Board of Works, and the Presidents of the Associated Chambers of Commerce, the Society of Arts, and the Royal Colonial Institute, as representing the mother country. The trustees to have the entire management and control of the annual expenditure for maintenance, etc., which is estimated at £12,000; and this, it is proposed, should be provided one half by England and the other half by the colonies, voted annually by their respective parliaments. No revenue is anticipated from the museum itself, as it would be undesirable to charge a fee for admission from the public, but a rental of £2,700 is estimated to accrue from letting the offices to the agents-general of the various colonies, and this would in the first instance go towards meeting the annual expenses of the institution.

From the prominent part taken by the colonies in the Exhibitions of Philadelphia and Paris, and the collections likely to be available from those of Melbourne and Sidney now coming on, the present is deemed an exceptionally favorable time for bringing the scheme to maturity, and we can only hope that the proposal of which we have given a brief outline, and which is destined to possess a truly imperial character, and fulfil truly imperial functions, may be supported both at home and abroad with the spirit it deserves.

Estimates varying from £65,410 to £50,526 have been received for the new Church of the Oratory at South Kensington, to be built from the designs of Mr. Herbert A. Gribble, who, it may be remembered, won the first prize in the recent competition, the conduct of which gave rise to so much dissatisfaction, so there is a prospect of this long-talked-of work being commenced at last: perhaps some day even the new Roman Catholic Cathedral for Westminster may come to the front. Speaking of cathedrals we are reminded that the late Sir G. G. Scott's great work, the cathedral church of St. Mary, at Edinburgh, is to be consecrated on the 30th of this month, and the clearing of the site for Mr. Pearson's cathedral at Truro is to be commenced immediately after Christmas, by the demolition of the present St. Mary's Church. The five hundredth anniversary of the foundation of New College, Oxford, was celebrated on the 14th inst., when the chapel was reopened, after having been renovated at a cost of £20,000, from the designs of Sir Gilbert Scott.

THE NEW CENTRAL MUSIC HALL. — ARTISTIC WORK IN TERRA-COTTA.

CHICAGO, ILL.

THE latest "investigation" we have had has been in relation to the new Music Hall now being erected after the plans of Mr. D. Adler. With the exception of the City, County, and Government buildings, the Music Hall is the most important architectural work now in progress in this city. It is situated on the southeast corner of State and Randolph Streets. It consists of a music hall proper with front on Randolph Street, but with the main entrance on State Street, and a business building on State Street with stores on the first floor, in the centre of which is the entrance to the Music Hall. But the business building contains not only the stores and offices, but a commodious concert hall for chamber music. While in the upper stories are large rooms for musical societies, and a suite of rooms designed especially for photographic purposes. Over the front portion of the Music Hall are a number of artists' studios, while the remainder of the auditorium has a glass roof. The ceiling of the hall under the glass roof is to be of rolled cathedral glass. The floor of the main hall is on a level with the street, and egress is provided on three sides. It will seat about 2,500 persons on the main floor and in two galleries. The seating arrangements are similar to those of a first-class theatre, but no provision will be made for scenery on the stage. The fact that the building is rented for a term of years to the Central Church, presided over by Rev. David Swing, is sufficient reason for such an omission, and in place of it a powerful organ will be erected, serving alike for church exercises and musical performances. The organ will be in two sections, placed one on each side of the stage.

The building is now being plastered and promises to be in every way an architectural success. The exterior is of Lemont limestone, and the entrance porch of polished red and gray granite. It belongs to a stock company called the Central Music Hall Company.

A few weeks ago Mr. L. G. Hallberg, an architect in this city, made a direct charge in one of the daily papers that the building was unsafe in two essential particulars, and predicted that it would be the scene of a horror similar to those of Rockford and Adrian. His letter was decidedly of the alarmist order, and such an one as, if allowed to receive credence from the public generally, or become the subject of town talk, was calculated to do serious injury to the reputation of the building, as long as it might stand. The Building Committee, therefore, decided to have an examination and report made by expert constructors. They selected R. G. Mason, civil engineer and ex-mayor, E. S. Chesbrough, late city engineer, Max Hjortsberg, civil engineer, and P. B. Wight, consulting architect. The report has just been presented.[1] As it will forever set at rest all ill-judged criticisms on the construction of the best building for the purpose that has ever been erected in this city, further comment is unnecessary.

A small book called Terra-Cotta in Architecture, being a republication of part of a work on Ceramic Art and Art Education, by James Joseph Talbot, of Philadelphia, and distributed as an advertisement by the Perth Amboy Terra-Cotta Company, has just made its appearance in Chicago. In giving what purports to be a historical account of the progress of terra-cotta manufactures in America, it makes a statement which fails to do justice to the part that Chicago enterprise should be credited with in the development of this art. Mr. Talbot says, "An establishment devoted especially to architectural work was started in Chicago, about the year 1868, but does not seem to have produced any work of much artistic importance. About ten years later its projector removed to Boston, and began the manufacture on premises in Federal Street. Early in 1879 this establishment passed into different ownership, and is now known as the Boston Terra-Cotta Works. They operate one kiln only, but produce some very creditable work." Mr. Talbot's knowledge of terra-cotta manufacture seems to be confined to the seaboard States, and I think that a visit to this city would considerably enlarge his ideas as to the capacity of the Chicago works and the quality of its workmanship. But as to the latter he could have found extensive evidences in many eastern cities. For the information of himself and your readers I will say, in contradiction of what his first sentence implies, that the Chicago Terra-Cotta Works are still in operation, and during the last two months have turned out $7,000 worth of work. This is not a large amount compared with their capacity and what was once done. But the demand for this work is increasing, and the production is of the highest order in artistic merit. Among the works now in progress are the new Museum of Natural History for the State University of Michigan at Ann Arbor, and the building for the Psi Upsilon fraternity at the same place, both of which contain much artistic work in *carved terra-cotta*, such as was first introduced in America by Mr. Sanford E. Loring. But among the works of "much artistic importance" produced in Chicago both before and while Mr. Loring was endeavoring to start a factory in Boston, and sent to eastern cities, may be found the following: In Philadelphia, where Mr. Talbot resides, may be seen work done in 1876 and 1877 on the exterior and interior of Christ Church Chapel, from designs of J. P. Sims, architect. Much of it is carved and "artistic" terra-cotta.

In New York the first example of carved red terra-cotta produced in America may be seen in Mr. Braehm's house on Thirty-sixth Street near Fifth Avenue, by Mr. G. B. Post, architect. The carved panels made in Chicago for this house are nearly four feet long, a remarkable size for such a material. All the terra-cotta finish for the Morse Building, on the corner of Beekman and Nassau Streets,

[1] We have already given the most essential parts of this report in our Summary, and do not therefore repeat it. — EDS.

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New York, except the finials of the front porch, were made at the Chicago Terra-Cotta Works. In Boston, two dwellings on Commonwealth Avenue for W. W. Lewis, architect, were finished with terra-cotta made in Chicago in 1877, and in these houses are the first fireplaces made of terra-cotta and brick in America, which are full of artistic carving, done in Chicago. In Providence may be found the following works designed by Stone & Carpenter and executed in Chicago: Mr. Godard's dwelling, fronting Brown University; the new dormitory of Brown University; the work on the Hotel Dorrance, commenced in Chicago and finished in Boston. In conclusion, let me add that inasmuch as what is known as "artistic terra-cotta" is work carved in solid clay just before it is fully dried, the first work ever done by this process was executed by Mr. Isaac E. Scott, a self-educated Chicago carver, and now a most successful designer and decorator, and is now in Plymouth Church in this city. The interiors and exteriors of our finest dwelling-houses recently erected from designs of Jenney, Addison, Wight, Treat & Foltz, Burnham & Root, and others in this city, contain quantities of examples of carved terra-cotta executed here, which we consider to have "much artistic importance."

THE POMPEIAN CELEBRATION.[1]

A *Times* correspondent was present at the excavation in the insula parallel to that numbered five in the north region, according to Fiorelli's plan, in a shop entered from the Decumanus Major, commonly known as the Strada de Nola, leading to the gate of that name. For the first five minutes there was a breathless silence as the men worked; then, as the scoriæ fell away, part of a green object became visible. In a moment the workmen's hands had cleared the space around it, and amid deafening cheers a small bronze horse, 9 inches in length, was held aloft. Then a large amphora appeared; then two bronze vases, one with handles; then a large iron key, and as each in turn was lifted high for all to see, "*Bene, bene!*" burst in a chorus of hearty satisfaction from the people. A list, with the briefest description of the things which then followed in rapid succession, would fill a column. There were at least a dozen bronze vases of different shapes, sizes, and uses, with and without handles, and in one a number of bronze coins oxidized together; and many other coins were found at intervals during the excavation. There were many handsome bronze fibulæ, several bronze bracelets, a number of rings, many terra-cotta vases, tazze, and amphoræ, and a remarkable number of little terra-cotta water cups for bird cages, various kitchen utensils, a spit, forks and knives of iron, a bronze bottle, a number of little bronze bells, a dagger with ivory handle, a knife with ivory handle, a bronze cas-erole, and a terra-cotta money-box.

There soon followed abundant proof that this had been the shop of a seed merchant and seller of singing birds, and very little imagination was required to see the place as it was the day before the fatal eruption of 79. At first the room seemed to have been a mere receptacle for a miscellaneous collection of bronze and earthenware objects. There was no special character about it. The walls bore no traces of painting; but, as the clearing continued, to the left of the door on entering a heap of millet seed was found, so carbonized that on taking up a handful it flowed between one's fingers, for every grain was separate and distinct. It was taken away in baskets full. Close to this a quantity of hemp seed and of what appeared to be small beans, in the same well-preserved condition, were found, and among them considerable fragments of the sacks in which they had been kept, the fibre and texture clearly distinguishable. Behind these heaps and against the wall more seed was dug out, mixed with pieces of carbonized wood, iron hinges and nails, and some iron hoops, evidently the remains of small barrels and bins which had been ranged on this side, while along the opposite wall a double row of terra-cotta ollæ for holding grain was gradually revealed. Suddenly there arose a cry, "*un ossa*," "*un scheletro*," and the excitement became intense; but the bones were small — at first they seemed mere fragments, and then the Director exclaimed, amid quickly following laughter, "A chicken." Here the filling in had become somewhat solidified, and as it broke apart a complete skeleton was revealed, It was that of a little singing bird, entirely imbedded in the mass, and near it were fragments of other tiny bones. There could no longer be any doubt that the use of the little terra-cotta pots had been correctly described. It became clear why so many of them were found there, and that the number of plain bronze rings of about an inch and a half in diameter, and pieces of fine chainwork discovered, had been used for hanging bird cages. But what connection had all those bronze vessels and ornaments near the door with a seed and bird seller's shop? This also soon became evident. As the excavators continued farther into the room, great masses of carbonized beams of wood were found, each somewhat inclined downwards, and among them a quantity of fragments of intonaco and stucco wall-facing, colored porphyry with a border of green and white. These were at once seen to be the remains of the floor of the room above, with some of the plastering of its walls; and from the direction in which the beams were lying, it was evident the floor had given way in the middle and towards the door of the shop below, precipitating the greater part of the contents of the upper room in that direction, the remainder falling towards the middle, and it was here the elegant long stemmed candelabrum was found among the masses and fragments of carbonized wood. Did the worthy bird-seller live above his shop? Did this candelabrum and the various bronze vases and other utensils form part of his domestic furniture? Who can tell? They were elegant in form, but for the most part unornamented, and not out of character with the requirements of a person of that condition. There were some finger-rings of bronze, but none of richer material; there was a strigil with a plain handle; there were women's bracelets and fibulæ of delicate workmanship, but only of bronze; some glass beads, and a delicate blue glass cup broken in pieces. The smaller terra-cotta vessels were all of the plainest workmanship. Among them were three small amphoræ, with flat bottoms for standing on the table, and the bronzes were of the variety of size and form adapted to household purposes. Some were like jugs with one handle, others were in the form of flat oval tazze with two handles, and one of these had two others of smaller size lying within it. There was one the exact counterpart of a pint pot, several of flat shape, like casseroles, with a straight handle on one side, and some without handles, like deep bronze soup plates.

Among other things found in this room were a number of small bronze bells slightly depressed into a rectangular form, like the tiny gold bell found on the Esquiline some years back, and which is so well known as the Margherita bell from the number of copies made for ear-drops; two double bronze inkstands, the chain and other fragments of a balance, a bone paper-cutter, — a knife of large size, with a bent blade like those used by gardeners, — a small square Corinthian pilaster cap of marble, and in one corner of the shop, against the wall, the remains of a mensola.

[1] Some fragments of this account have been given in a previous number.

A RECORD OF GREAT FIRES.

HISTORY is full of accounts of the devastation caused by fire in the cities and towns of nearly every country of the civilized world. A record of these conflagrations cannot but be of interest. In the year 798 London was almost entirely destroyed by fire, and again in 982 the greater part of the city burned. In 1086 all houses and churches, from the East to the West Gate, burned. What is known as the "great fire" occurred in 1666. It began September 2, and continued three days, burning over 436 acres. Houses to the number of 13,200, including many public buildings, were destroyed, and six persons were killed. The loss was estimated at $50,000,000. In 1794, 600 houses burned; loss over $5,000,000. In 1834 the Houses of Parliament were destroyed; 1871, Tooley Street wharves burned, entailing a loss of $10,000,000; in 1873, Alexandria Palace was destroyed. The great fire at Edinburgh occurred in the year 1700. At Brest, France, in 1784, explosion and fire in a dockyard caused a loss of $5,000,000. Paris (Communist devastations), 1871, $160,000,000. A fire at Rome in the year 64 lasted eight days, and ten of the fourteen wards of the city were destroyed. Venice, Italy, was almost wholly destroyed by fire in 1106, and in 1577 the greater part of the city was ruined by an explosion during a fire at the arsenal. Leipsic, Germany, in 1420 lost 400 houses; 1491, Dresden, Germany, was destroyed. In 1811 forest fires in Tyrol destroyed 64 villages and hamlets. In May, 1842, at Hamburg, a fire raged one hundred hours; during the fire the city was in a state of anarchy, 4,219 buildings destroyed, one fifth population homeless, and 100 lives lost; total loss, $35,000,000. After the fire contributions from all Germany came in to help rebuild the city. At Copenhagen, in 1728, 1,650 houses burned; 1794, Royal Palace, with contents, destroyed; 1795, 1,563 houses burned. At St. Petersburg, in 1736, 2,000 houses were burned; the great fire occurred in 1862, when the loss was $5,000,000. In 1752, at Moscow, 18,000 houses were burned. On September 14, 1812, the Russians fired the city to drive out Napoleon. The fire continued five days, and nine tenths of the city were destroyed. The number of houses burned was 30,800, and the loss was $150,000,000. At Constantinople, in 1729, a fire destroyed 12,000 houses and 7,000 persons. In 1745 there was a fire which lasted five days; January, 1750, 10,000 houses burned; April, same year, loss $10,000,000; later, same year, 10,000 houses destroyed; 1751, 4,000 houses; 1756, 15,000 houses and 100 persons; years 1761, 1765, and 1767, other great fires; 1769, 1771, and 1778, great fires; 1782, fire burned three days, 10,000 houses and 100 lives lost; February, same year, 600 houses; June, 7,000; 1784, 10,000 houses; 1791, between March and July, 32,000 houses burned, same number in 1795; 1707, in in suburb of Para, 13,000 dwellings, and many magnificent buildings destroyed; 1861, August 16, 12,000 houses and 3,000 shops in finest quarter were destroyed; 1818, August 13, fire destroyed several thousand houses; 1826, 6,000 houses; 1848, 500 houses, 2,000 shops, loss estimated $15,000,000; 1865, great fire destroyed 2,800 houses and public buildings, 22,000 persons left homeless; 1870, June 5, the suburb of Pera, occupied by the foreign population and native Christians, was swept by a fire which destroyed over 7,000 buildings, many of them among the best in the city, including the residence of the foreign legations; loss estimated at nearly $25,000,000. Scutari, Greece, 1797, 3,000 houses burned. Smyrna, Greece, 1763, 2,600 houses consumed; loss, $1,000,000; 1772, 6,000 houses; 1796, 4,000 shops; 1841, 12,000 houses. Yeddo, Japan, 1872, six square miles burned over, 20,000 persons homeless; 1873, 10,000 houses destroyed.

At Boston, Mass., 1679, all the warehouses, 80 dwellings, and

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vessels in the dockyards were consumed, loss $1,000,000; 1760, fire caused loss of $500,000; 1787, 100 buildings destroyed; 1794, 96 buildings burned; 1872, great fire November 9 and 10, the richest part of city destroyed, an area of 65 acres burned over, 776 granite and brick buildings consumed, loss $75,000,000. Charleston, S. C., 1778, fire caused the loss of $500,000; 1796, 300 houses burned; 1838, one half of city burned, loss $3,000,000. Savannah, Ga., 463 buildings, loss $4,000,000. New York, 1835, 530 buildings in business centre of city destroyed, 52 acres burned over, loss $15,000,000; 1845, 300 business blocks, 35 persons killed, loss $7,500,000. Pittsburgh, 1845, 300 buildings destroyed, loss $10,000,000. Albany, 1848, 600 houses burned, loss $3,000,000. St. Louis, May 17, 1849, 15 blocks, 23 steamboats, loss $3,000,000; May 4, 1851, three quarters of the city burned, 2,500 buildings, loss $11,000,000; same year, 600 houses, loss $3,000,000. Philadelphia, 1850, July 9, 400 buildings burned, 30 lives lost, loss $7,000,000; 1865, 50 buildings burned, 20 persons killed, loss $500,000. Washington, 1851, part of Capitol and whole of Congressional Library burned. San Francisco, May 4 and 5, 1851, 2,500 buildings and a number of persons burned, more than three fourths of city destroyed, loss $10,000,000; June, same year, 500 buildings, loss estimated at $3,000,000. Chicago, 1857, 14 lives, $500,000; 1859, September 15, $500,000; 1866, August 10 and September 18, $500,000 each; 1871, the greatest fire of modern times, October 8 to 10, 2,124 acres, or 3⅓ square miles, burned over in the very heart of the city, 250 lives lost, 98,500 persons made homeless, and 17,430 buildings, one third in number and one half in value of buildings in city, consumed, loss estimated at $190,000,000. Troy, N. Y., 1862, nearly destroyed by fire. Portland, Me., 1866, great fire of July 4, one half of the city burned, 50 buildings blown up to stop the progress of the fire, loss $11,000,000. Quebec, 1815–1816, $1,000,000; 1845, May 28, 1,650 houses burned, one third population made homeless, loss $3,000,000; another fire, June 28, 1,300 dwellings, 6,000 persons made homeless, loss $1,000,000; 1866, 2,500 houses and 17 churches in French quarter burned. St. John, N. B., 1837, January 13, 115 houses and nearly all the business part of the city burned, loss $5,000,000; 1877, June 21, 290 acres burned over, 1,650 dwellings, 18 lives lost, total pecuniary loss, $12,500,000. St. Johns, Newfoundland, 1846, loss $5,000,000. Montreal, 1850, June 7, 200 houses in finest part of city burned; 1852, July 9, 1,200 houses burned, 10,000 persons destitute, loss $5,000,000. Santiago, South America, fire in the Jesuit church, 2,000 persons perished. — *Fireman's Journal.*

THE GRAND STANDS AT ADRIAN, MICH., AND TOLEDO, O.

To the Editors of the American Architect:

Dear Sirs, — In justice to Mr. N. B. Bacon, of this city, who designed and superintended the Toledo Grand Stand, I wish to say that his evidence before the coroner's jury at Adrian, Mich., as printed, carries the wrong impression. The original plans and specifications were and are considered by the most competent builders sufficient to insure a structure amply strong for any emergency. There were, however, braces added "as an afterthought," simply to resist the heavy winds, which often prevail in fall and winter, in the region of Tri-State Fair Grounds. These braces, however, have nothing to do with the general strength of the structure, as far as supporting weight is concerned. No braces were added to prevent the roof from spreading, as there was no possibility of such an occurrence, as originally planned. Mr. Sizer, the architect (?) of the Adrian stand, could not copy the construction of the Toledo stand, nor could any one, without removing the seats and the finish underneath them. Consequently the most important points in the construction of the Toledo stand, and those which the superintendent of the structure was at greatest pains to enforce during its erection, were wholly overlooked in the Adrian stand. The Grand Stand at Toledo Tri-State Fair Grounds is well known to horsemen, all over the country, as having been repeatedly put to the very severest tests. It has several times contained nearly double the number of persons the architect intended it to hold, and yet the slightest tremor cannot be detected. The Adrian Grand Stand was built stronger than the plans showed. The plans indicated 2 by 16 inch seat-carriages, sawed out like the rough stringer of stairs, leaving only four or five inches of timber. The owner had 2 by 8 inches put in instead, and the seats built on them. Enclosed please find sketches of both stands.[1] R.

AN ARCHITECT AND HIS SUB-CONTRACTOR.

St. Louis, October 27, 1879.

To the Editors of the American Architect:

Dear Sirs, — Having been an attentive reader of your valuable journal for a number of years, and admired the plain and open manner in which you attack all unprofessional actions, I take the liberty to write and ask your opinion on a subject which has caused me much reflection lately. For instance, should an architectural firm allow one of the sub-contractors on a building which they are superintending to display a sign to the effect that they "pay no commissions to architects or agents," and that "owners will do well to confer with them direct." How would this, in your opinion, affect their standing as architects and relations to the profession at large?

An early answer through your paper will greatly oblige,

Yours respectfully, "Junior."

[1] These sketches are printed in the plates of this number. Anything more ignorant and foolish than the framing of the Adrian Stand is seldom seen, we trust. — Eds.

PUBLICATIONS RECEIVED.

A Practical Treatise on Natural and Artificial Concrete: Its Varieties and Constructive Adaptations. By Henry Reid, author of The Science and Art of the Manufacture of Portland Cement, etc. New Edition. London and New York: E. & F. N. Spon. 1879.

Terra-Cotta in Architecture. By James J. Talbot. 1879.

Illustrated Catalogue of Locks, Builders' Hardware, and Cast Bronze and Brass Work, manufactured by Hopkins and Dickinson Manufacturing Company. October, 1879.

NOTES AND CLIPPINGS.

What constitutes a Pedestal? — The Assistant Secretary of the Treasury has instructed collectors of customs that the decision which admits pedestals or statues at the same rate of duty as statuary, when such pedestals are invoiced and accompany the statues, should be strictly construed. The pedestal and statue must be evidently intended for each other. An importation by a dealer in marble-work of several figures, with as many pedestals, adapted to one as well as another, and as well adapted to receive an urn as such figures, would not come within the decision. Such pedestals should be classified as manufactures of marble, liable to a duty of fifty per cent ad valorem. When the work claimed to be a pedestal is out of proportion to the statue which is to surmount it, so that it becomes a monument with a statue surmounting it rather than a statue with its appropriate pedestal, such a structure will not be regarded as part of the statue. It is not intended that dealers shall enter expensive monuments, which are in fact manufactures of marble, at a duty of ten per cent ad valorem, by merely importing with them or placing upon them cheap figures in marble, although such figures may be brought within the definition of statuary.

Statue of Samuel Adams. — The model for the bronze statue of Samuel Adams made by Miss Annie Whitney has been adopted by the special committee of the Boston board of aldermen. The city is to pay Miss Whitney $4,800 for the statue, which will be cast at the foundry of the Ames Manufacturing Company, of Chicopee, Mass. It will be ready for delivery on July 1, 1880, and it will probably be unveiled on the 4th of July following.

The Architect of Abbotsford. — Mr. Blore, an architect, from whose designs Abbotsford was built, died lately, aged eighty-nine. Sir Gilbert Scott succeeded him as architect to Westminster Abbey.

Insurance and Fire Losses. — The fire insurance companies have power, if they choose to exercise it, to reduce the number of fires in this country annually seventy-five per cent, and the losses proportionately. Fires occur because insurance is cheap and easily obtained. This induces carelessness, recklessness, and incendiarism. In the list of causes of fire there are none mentioned, unless we except the few caused by lightning, that could not have been prevented by the exercise of ordinary precaution. If the insurance companies would insist upon the exercise of this precaution, both as a means of prevention and extinction of fires, instead of $100,000,000 annual loss we should not have $20,000,000. — *Fireman's Journal.*

The Precious Metals in the Industrial Arts. — The Director of the Mint is making an effort to ascertain what has never been known accurately, — namely, the amount of precious metals used in the arts, sciences, and manufactures. Very frequently estimates have been made, based upon the amounts coined and exported compared with the amount produced, and the Silver Commission of 1876 placed $46,000,000 as the probable value of gold and silver absorbed in this way. But Mr. Burchard desires to ascertain the facts as closely as possible, and has addressed a letter to all the manufacturers of the country who use precious metals, to chemists, and to those who are supposed to be informed on the subject. All the communications are to be treated as confidential, but Mr. Burchard proposes to prepare a statement showing the amount of gold and silver absorbed in other ways than by coinage.

A Belgian Winter Garden. — The winter garden which the King of the Belgians has had constructed in the park of Laeken is the largest structure of the kind in Europe. The immense cupola of iron and glass is two hundred feet in diameter, and one hundred feet in height in the centre. It is supported by thirty-six columns of white stone, each over three feet in diameter.

Anecdote of Mr. Hunt. — The late William M. Hunt had, as is well known, a comprehensiveness in his ideas of art which led him to contemn that minute attention to detail which is so often mistaken for artistic excellence. A friend who met him soon after the completion of his great work at Albany congratulated him on having had a subject so worthy of his powers. "Well," said Mr. Hunt with a gravely humorous air, "it *is* better than staying at home and fumbling two or three years over a button." — *Boston Transcript.*

Oak and Teak. — In 1878 there were imported into Great Britain 60,254 loads of oak, of the estimated value of £354,916, against 120,118 loads in the previous year, being a decrease of 59,864 loads. The various oak-producing countries contributed as follows: Russia, 3,151 loads; Germany, 25,048 loads; Austria, 3,014 loads; United States, 2,641 loads; British America, 25,402 loads; other countries, 998 loads. Last year, 37,990 loads of teak were imported to Great Britain, against 20,072 loads in 1877, showing an increase of 9,918 loads. — *Timber Trades' Journal.*

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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THE programme for its school-house competition published by the *Sanitary Engineer* offers four premiums, amounting in all to five hundred dollars, for designs for a Public School Building to contain eight hundred pupils, boys and girls in equal numbers, and to occupy a lot one hundred feet square enclosed by buildings on three sides and open on the north. The building is to be of brick, with timber floors and fire-proof staircases, and separate entrances and class-rooms for boys and girls. It is to contain an exhibition room large enough for all the pupils, two teachers' rooms, each of one hundred and fifty feet area, with class-rooms enough for all the scholars, the boys and girls being separated, and each room containing fifty-four or fifty-six. The points which the judges are to consider in making their award are: (1) Convenience of arrangement; (2) security from fire and means of egress; (3) distribution of light; (4) ventilation and heating; (5) drainage and other sanitary appointments. The designs are to be sent, under motto, to the editor of the *Sanitary Engineer* before two o'clock on the 2d of February. They are to include ground plans, one geometric elevation, and one or two sections as the design may require, all to be rendered in line with pen and ink, without shading or tinting except the usual tinting of the walls, floors, and roofs on plans and sections. The committee of award will be Mr. George B. Post, architect, of New York; Dr. John S. Billings, U. S. A.; Hon. John D. Philbrick, U. S. Commissioner of Education at Vienna and Paris; Mr. William R. Ware, Professor of Architecture in the Massachusetts Institute of Technology; and Dr. C. R. Agnew, of New York. The committee are expected to render their decision a fortnight after the plans are submitted, and besides the four premiated designs, the six which are next approved will be published in the *Sanitary Engineer*. All the designs will be returned to their authors.

THIS programme is considerately arranged with an eye to giving the competitors the minimum of work consistently with its purposes, while it rules out the special tricks of rendering by which some competitors try to give their designs a factitious advantage over others, — tricks, to be sure, which would have little chance of effect on the particular committee to whom the designs are to be submitted, — and it gives a reasonable time for preparation of the designs, with allowance for the necessary preoccupations of competitors. In these respects it is an excellent example, and we trust that it may have a wholesome influence on the projectors of other competitions. The premiums offered will not be a great inducement except to draughtsmen and unemployed beginners; but the case is not one of a client or committee requiring plans for actual service, and therefore to be expected to pay a fair price for benefit received, while the problem is one of so much importance, the study and discussion of it so much a matter of public spirit, that we hope men of experience will be tempted to contribute their plans from interest in the subject itself. The competition will doubtless be followed, as was the previous one, by a public exhibition, which is much to be desired as a stimulus to public interest in the subject, as a means of making public the lessons which are to be derived from the plans, and also to give the competing architects a chance to show what they have done. The architecture of the designs is not made one of the points by which the committee's award is to be determined, as was natural enough, this not coming within the scope of the *Sanitary Engineer*. It will be impossible, however, for an architect to design a building without giving heed to its architecture, however simply he may treat it: with a public exhibition before their eyes it may be hoped that the competitors will offer designs that shall be worthy of notice in this respect, and that the committee will find occasion to take this into account in their report if not in their award.

THE number of scholars for whom accommodation is required by the programme seems to us altogether too large. No doubt this and the size of the lot were fixed upon as answering to the ordinary conditions of school-houses in great cities. But this is just one of the points where the ordinary conditions of school-houses want overhauling. No one thing in our school system, we believe, leads to greater immediate danger in case of disaster, or indirectly to more evils in association and management, than the hiving together of whole townfuls of children in a single building. Half the proposed number is as many as ought to be cast together in one city school-house; and we should say fewer rather than more. As far as we can judge, without actual study of the problem, we should say that half the number was as many as the proposed lot would comfortably provide for. A hall to accommodate eight hundred scholars, with room for a stage and some visitors, should have an area of about five thousand feet, and this, in whichever story it was placed, would cover half the lot. With this must be fifteen or sixteen class-rooms of, say, twenty-five by thirty feet, pretty high, with their long sides open to the light, beside teachers' rooms, cloak-rooms, etc., and separate corridors and stairways for boys and girls. The children need exercising yards, and for school-rooms in an enclosed lot the width of an ordinary street — forty or fifty feet — is not too much open space to have before the windows in the lower story of a high building. The conditions, then, seem to require no less than three stories of class-rooms, and probably an additional one for the exhibition hall. But a school exhibition room should not, any more than a theatre or concert hall, be lifted three or even two stories into the air, nor should scholars who have already climbed one or two stories be sent up twenty-five feet higher to find their rooms above it. We make a point of this, because we are convinced that the skying of children in the upper stories of high buildings, and crowding them by hundreds in close quarters, is one of the follies of our present system, to which public attention ought to be persistently directed, and against which such papers as the *Sanitary Engineer* and the *American Architect* should lift up their voices. It would, in our opinion, have been wiser, instead of assuming the habitual conditions of over-population in a city school-house, and requiring the competitors to conform to them, to have made it one of the points in the problem to determine for how many children it was well to build a school-house on such a lot as was assumed. The perennial feat of putting a quart into a pint pot was essayed in the tenement-house competition, and proved, as usual, impracticable.

A MOVEMENT is on foot in Boston, it is reported, to found a society for promoting the adornment and improvement of the city. The project is a new and interesting one. Nothing needs more care and more consideration on a broad scale than the ornamental treatment of a city, and nothing gets less. The care of the aspect of our towns is preëminently one of the things which, being everybody's business, are nobody's business. The two ways in which the towns have got their shape are both unfavorable to elegance and to making the most of their natural opportunities. The older ones have grown according as momentary convenience and the immediate interest of property-holders have dictated from time to time. The newer ones are commonly laid out to suit the convenience or the symmetry of the drawing board and square. In very few of them has there been any thoughtful effort to make the most of natural advantages of site, or to lay out what is done for adornment with an eye to general effect. The consequence is that our new cities are apt to be inexpressibly dreary; and in our older ones, when they come to need improvement, this is made enormously expensive by the fact that the greater part of the improving consists in undoing what has been done before. Streets have to be

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widened, or straightened, or cut through thickly built regions. Spaces which ought to have been reserved for special uses, or kept open for the public benefit, have been appropriated to inferior purposes, and have to be reclaimed or replaced at enormous cost, while many opportunities which foresight might have turned to account are neglected. Boston herself is an example of the good and bad results of an unregulated growth. Her wayward streets are a standing puzzle and a byword to strangers, but they are singularly convenient to her inhabitants, and are full of picturesque effects, or opportunities for them. She has hacked away at her elevations and spread out her plains, till she has reduced the most of her close-built territory to an unwholesome level, which till now she has found impossible to drain. She has a water front of very unusual extent and capacity for beauty, almost every foot of which she has made an eyesore. With rare good fortune she has reserved for public use in the midst of the city a beautiful open area which is a delight to her people; but this comes of private gift, not of municipal forethought, and even now the more considerate part of her citizens is kept in constant anxiety to preserve it from the speculative rapacity that has sacrificed others of her beauties. In spite of the money she spends in taking care of her looks, the approaches to the city proper are almost unanimously slovenly. The great fire and the occupation of the Back Bay have renewed her architecture, and the wealth of her proprietors has made it more attractive than that of any other American city, but her public buildings and her monuments are an incoherent jumble. With her new park projects she has entered upon a series of improvements which had become very desirable, and will, if rightly carried out, bring many others in their train, and for these she needs all the guidance and help that her citizens will give.

We do not yet learn what is to be the organization of the new association. It is understood that an incorporated society is proposed which shall be able to receive and administer bequests for the improvement of the city, to watch the opportunities for improvement and the dangers of injury, and to interpose with suggestion, advice, or assistance. If such an association is well managed and influential, there is no end to the good service it may do. Most of the ornamentation of our cities is provided by individuals acting without reference to each other, and commonly each to carry out a notion rather than to supply a want. The public works of adornment are carried on under ever-varying influences, without system or persistent plan. A society which should act as a permanent advisory council, with strength and judgment to make itself respected by the public, could accomplish many desirable things, prevent many mistakes, and could in a great measure arouse and control private liberality, of which the current is unending. One danger to be guarded against, it strikes us, is that of doing things in an amateurish way. The adornment of cities is altogether an artistic work, and so demands professional judgment, but most of it is controlled, and the works of art selected or commissioned for it, by persons who are not artists, and without the assistance of artists. In older communities than ours people have learned better than this, and know the value of professional counsel. Since the new society proposes to influence the artistic handling of its city, and will have to deal with questions of architecture and other arts, it may be hoped that it will provide itself with a competent membership of architects and other artists. Otherwise, however judicious it might be in its general system, or in its advocacy of measures, it would be in danger of unnecessary shortcomings in the execution of its plans, and would certainly fail to be the helpful counsellor that it might be.

We mentioned a short time ago the accident which happened to Signor Brumidi, when he barely escaped a fall from the high scaffold, on which he was painting a frieze of the rotunda of the Capitol at Washington. The bodily injury which he received was apparently trifling, but the nervous shock was enough at his advanced age to make it impossible to resume his work on the rotunda. The work which occupied him was a band of historico-allegorical figures around the drum of the dome, painted in chiaroscuro, which has excited the wonder of the unlearned in art by the dexterity with which, through tricks familiar to the experienced, it is made to simulate a bas-relief. This is the most pretentious manifestation we have, and we hope it is the last, in any important position, of a kind of decoration which a few years ago, under the misnomer of fresco painting, invaded the country, but which has now been relegated for the most part to rural townhalls and churches. One cannot refuse sympathy to the earnest desire which the venerable painter is said to express that he may live to see his design, of which he has executed only a third, the consummation of the work he has been doing in the Capitol for twenty-five years, finished by other hands, if his are no longer capable. He still hopes, it is said, to finish his cartoons for the work, and that another artist may be secured in Italy who will copy them upon the walls. We trust that Signor Brumidi has before him a life as long as is compatible with human happiness; nevertheless we must seriously hope, in the interest of sound art, that neither he nor any of this generation may live long enough to see his interrupted design completed. And without committing ourselves to the doctrine of protection to native art, in which we do not believe, we may also hope, having before our eyes the work of Hunt at Albany, and of La Farge in Boston and New York, that no more painters will be imported from Italy to take up the decoration of the Capitol where Brumidi has left it.

The Annual Convention of the American Institute of Architects is to be opened in New York on Tuesday the 18th of November. We have not yet received any programme of its exercises. The American Public Health Association will begin its annual meetings on the same day at Nashville. The chief subjects that are appointed for discussion are the Sanitary Condition of Cities and Towns, especially those of the Southern States, and Practical Questions connected with the Management of an Actual or Threatened Outbreak of Yellow Fever. Among the papers that are promised, those which should be of special interest to architects are one on Public School Buildings, by Dr. G. B. Balch of Yonkers, N. Y., one on Drainage and Sewerage of Cities, by Col. George E. Waring, Jr., of Newport, and perhaps one on Public Baths, by Dr. E. C. Angell of New York. The president of the association, Professor J. L. Cabell, being also president of the National Board of Health, whose duty it is made to report to Congress at its next session a plan for a national public health organization, has issued a circular inviting all state and local boards of health, as well as other sanitarians, to meet in conference with the Public Health Association at Nashville.

THE RECOLLECTIONS OF SIR GILBERT SCOTT.[1] III.

The Midland Railway Terminus and the Prince Consort Memorial, both obtained through competition, are among the most conspicuous works of Mr. Scott, and were completed about the same time. Of the latter, he says, the principal motive was "the realization in an actual edifice of the architectural designs furnished by the metal-work shrines of the Middle Ages." The experiment was a dangerous one, and the criticisms which it met, both before and after its completion, were, perhaps, the most severe to which any work of Scott had been subject. He disposes of them *en masse* by saying that "most of them are groundless, some wholly untrue, some merely stupid, and most of them simply malicious." And furthermore, "this being my most prominent work, those who wish to traduce me will naturally select it for their attacks. I can only say that if this work is worthy of their contempt, I am, myself, equally deserving of it, for it is the result of my highest and most enthusiastic efforts. I will also congratulate our art, so industriously villified by the same party, on this, that if the Prince Consort Memorial is worthy of contempt among the works of our age, it argues favorably of the present state of the art among whose productions this is selected for vituperation."

The long and brilliant list of Scott's successful competitions was rudely broken in upon by his "great failure," as he calls it, in the contest for the Law Courts. Scott threw himself vigorously into this competition; the prize was great, his prestige was unbroken, and he had high hopes of victory. The waste of time and labor involved in a great competition like this is made very clear by his account of his preparation for it.

"The instructions were unprecedented in voluminousness, and the arrangements were beyond all conception complicated and difficult, which was further enhanced by the insufficiency of the site. The business of every conceivable department of law had to be studied and its officers consulted over and over again. It took me, I think, from April to September to get up my information, and throw it into anything like shape, and at length I succeeded in packing together in what I had reason to think a good form every room required, to the number, I should think, of some thousands. We were told that arrangement alone was to settle the competition, so I neglected the purely architectural work until a late period. Then, however, I took it practically in hand, working at it at odd times while my more practical study was going on, and then taking

[1] *Personal and Professional Recollections by the late Sir George Gilbert Scott, R. A.* Edited by his son, G. Gilbert Scott, F. S. A., etc., etc. London. 1879.

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a month at the sea-side for this department exclusively, besides much subsequent work on my return home. No previous competition had involved me in such an amount of labor."

Of his design, when completed, he speaks with his usual complacency. "I do not know that my general design was of much merit, though I think that it was fully as good as any recent work I know of by any other architect. Of its parts I am bold to say that many exceeded in merit anything I know of among modern designs." Of the course of the competition and the manner in which the final decision was reached, and the comparative merits of the other designs, Scott speaks with that queer mixture of wounded vanity, frankness, and spite which has been the peculiar reproach of artists in all ages, but to which it would seem an architect with a lifetime of large and varied practice behind him ought to be superior.

"The competition judges, wishing to follow the advice of the assessors, desired to give their verdict in favor of Mr. Barry, but as his architecture was approved of by no one, they conceived the idea of linking on to him some other architect, in whose architectural powers they had more confidence, and they pitched upon Mr. Street, whose arrangements no one had ever spoken in favor of. I at once protested against this as a palpable departure from the conditions. . . . . Mr. Street complained of my protest, and I then wrote to the Government, stating that if the judges reaffirmed their decision I should abide by it. They did very unjustly reaffirm it, but the law officers of the Crown cancelled the decision as unfair. . . . . I felt bound to adhere to my promise, and I withdrew from the competition, though I was vain enough to feel that my merits, architecture and plan together, exceeded those of any other competitor, an opinion to which I still adhere. Mr. Waterhouse was, perhaps, the closest rival, but Mr. Street had but a poor plan, while his architecture was unworthy of his talent, and had evidently been very much hurried, while Mr. Burges, though his architecture exceeded in merit that of any other competitor, was eccentric and wild in his treatment of it, and his plan was nothing. . . . . I am myself content. I was not beaten, for the first decision, which went against me, was declared null and void, while before the final decision I had withdrawn from the competition. So ended the labors of three quarters of a year."

Perhaps the most interesting portion of Scott's practice lay in the work which he did in the restoration and refitting of the various cathedrals. Almost every cathedral in England came at one time or another under his hand, and his accounts of their condition and the work done upon them make, we are inclined to think, the most valuable portion of these recollections. Here is an interesting description of the anatomy of the central spire of Salisbury: —

"Our great work was the strengthening of the tower. The original thirteenth century builders had erected a central tower, rising sufficiently high to receive the roofs of the four arms of the church. The story against which these roofs abutted is a very light structure, and was intended to be visible from within. It is perforated in its thickness by a triforium gallery, leaving externally a wall of little more than two feet in thickness, while the interior consists of a light arcade with Purbeck marble shafts. The corner turrets have each a staircase, rendering them mere shells.

"On this frail structure the fourteenth century builders carried up the vast tower some eighty feet high, with walls nearly six feet thick, and upon this a spire rising one hundred and eighty feet or more. It need not, then, be wondered at that the older story, so unduly loaded, should have become shattered. Subsequent builders have bolstered it up by flying buttresses, and by every form of prop they could invent, till, as Price calculated, the sectional area of the added supports exceeded that of the original structure. Still the crushing went on, and, when I examined it, had proceeded to very alarming lengths. I proposed to bond it together (in addition to the numerous ties it already had) by diagonal iron ties, and then gradually to insert new stones in place of those which were shattered."

At Ripon, it was found that all three towers were in a dangerous condition. "The western towers had sunk dreadfully, and were split from top to bottom on three sides, if not four. The cracks were nearly a foot wide. We underbuilt the walls for some twelve feet below their old foundations, propping them up meanwhile with an enormous mass of timber shoring. The danger was terrific. At one time a perfect avalanche of rubble roared in upon the men engaged below from the centre of the wall over their heads."

At St. Alban's, in underpinning the angle of the central tower, a singular discovery was made. "Its foundations had been excavated into a sort of cave, some five or six feet in diameter, which was filled in with rubbish, mere dust, with some timber struts among it. I can only conceive that this had been done with the intention of destroying the building by setting fire to the struts, but that the process had been suspended, and the tower has remained propped up on short oaken struts from the Reformation till the recent repair."

The pleasure of all the work on the cathedrals was doubtless marred somewhat by the ferocity of the anti-restorationists, who, like most men who mix up morals with fine arts, threw common sense to the winds, and pursued their unhappy victims with all the venom of theological controversy. Scott's protest against this extravagance is reasonable and manly, but a little less of personal sensitiveness, and a little more of personal dignity, would have better become a man who had made good his position by so many years of skilful and judicious work.

His chapter on the Gothic revival is interesting, but not altogether satisfactory. It attributes the "awakening" chiefly to the books of the elder Pugin, notably the specimens, and the adoption of the foreign features to Ruskin. But it is extremely doubtful whether any such change as the one in question was ever made general through the influence of literary works alone. Pugin's and Britton's works were no doubt among the first signs of the coming change, but other causes were at work. One of these, of which Scott, in his book, unaccountably omits all mention, was the rebuilding of the Houses of Parliament in the Tudor style, and the employment of the younger Pugin as Barry's assistant, who for nearly twenty years made nearly all the drawings for the interior detail, and under whose enthusiastic lead was marshalled the army of workers in wood and stone, iron and brass, tiles, mosaic, stained-glass, etc., which taught the people of that generation what modern artisans were capable of in the way of decorative art. That was the true beginning of the Gothic revival. Ruskin's writings, photography, the increase of foreign travel, the establishment of art-schools and museums, and the energetic impulse of a new interest, rapidly modified the fashion of architectural design from year to year, till the lately admired classic forms were forgotten or despised. Scott lived to see the movement, whose life was almost exactly contemporaneous with his own, reach its height of prosperity and influence and enter on a period of rapid decline. It had no more conscientious, consistent, and liberal-minded leader than himself.

THE OPEN FIRE-PLACE. XVIII.

SPECIAL FORMS OF CONSTRUCTION.

IT is clear that for a given amount of fuel burned any furnace may, by extending the heating surface, be made to yield the same amount of heat to the fresh air, but the heating surfaces may be ill or well constructed with reference to favoring the draught, economy of space, tightness of joints, facility for cleaning, durability, and cheapness, and upon this depends its value. The various kinds of hot-air furnaces now in use are characterized by the degree of excellence obtained in some one or other of the above desiderata, no one combining all the excellences, so that in searching for the form best adapted to our purpose many must be reviewed. In so doing we find that they divide themselves into two general classes: first, those in which the hot air circulates in flues, while the smoke fills the space surrounding them; and second, those in which the reverse takes place, the smoke being inside and the fresh air circulating around them.

The heating effect of the latter method is, for the same extent of

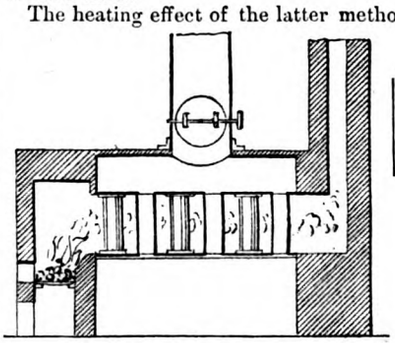

Fig. 130.

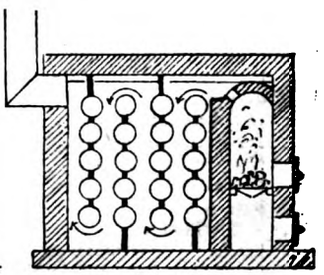

Fig. 131.

surface, much greater than that of the former, because when the smoke passes through the flues the heat radiated from the surface warms the inner walls of the surrounding air-chamber, which, in its turn, gives up its heat to the fresh air in contact with it. Thus both surfaces serve in heating the air, and the furnace acts both by radiation and by convection. The effect produced varies but little with the extent of the chamber, because the amount of heat which it receives is constant, and the smaller its surface the higher its temperature. By the former method all rays of heat which do not strike the fresh-air flues are lost. Figs. 130 and 131 represent furnaces of this class. In Fig. 130 the smoke flows horizontally across perpendicular fresh-air tubes, and in Fig. 131 the movement of the smoke is perpendicular, and that of the fresh air is horizontal. All the heat received by the masonry of the furnace is lost, since no fresh air is brought in contact with them to carry it off. Abandoning, therefore, this class of furnace, we have only to consider those in which the smoke circulates inside of the flues, and the fresh air surrounds them.

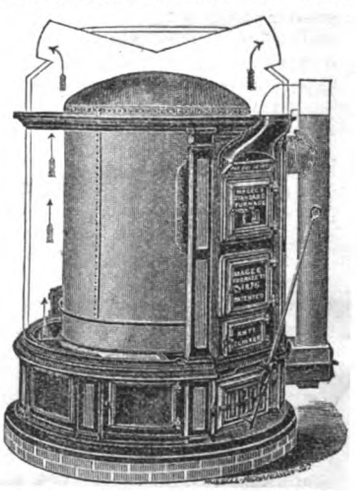

Fig. 132.

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These, again, may be classified into, first, those having simple drums, like the Magee Furnace (Fig. 132), and second, those having detached tubes, as in the Chilson (Fig. 134). The former has the advantage of simplicity and the minimum of joints for the escape of gas, and the latter of a greater radiating surface. In an ordinary furnace the first consideration is of the greatest importance, because a leakage of dangerous gases may take place without the knowledge of the occupants, in case of downward draughts. Where the furnace is used over an open fire-place leakage may at once be detected by the appearance of the fire, and cured by simply opening the direct smoke-draught, so that this freedom from joints, though important, is of less consequence than an increase of radiating surface.

The movement of the fresh air may take place in the same direction with the smoke or in an opposite direction. When the currents flow in the same direction the smoke will evidently cease to give up its heat when the two gases have the same temperature. But when the currents take place in opposite directions the temperature of the smoke may be lowered to any extent, only limited by that of the outside air. With a basement furnace, as ordinarily constructed, the requirements of the draught are such as to render total extraction of the heat from the smoke undesirable, but where the construction is like that shown in Fig. 129, such a result would be an important desideratum.

In the Peerless Furnace (Fig. 133), we have an illustration of this principle. It is not necessary, however, to have the smoke descend in order to accomplish the work. The smoke may rise direct and the fresh-air current be reversed.

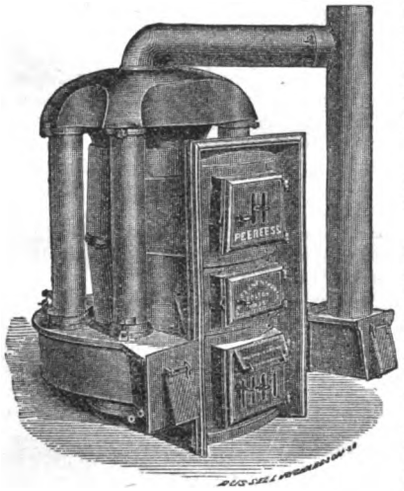

Fig. 133.

The Chilson Furnace (Fig. 134) is an example of direct smoke-draught.

When the movement of the smoke or fresh air is upwards, if it be divided into separate currents, some means should be adopted to direct the flow equally into each, as otherwise it would follow by preference that which offered the least resistance, and when everything appears to be disposed in a manner perfectly symmetrical, the slightest difference determines the movement in one direction or in another. The current will only divide itself equally when the flues have, in the aggregate, a sectional area equal to that of the main pipe, and when the branch flues are themselves equal in area to each other. When, however, the gas flows in a reversed or downward direction, the division will be uniform in the flues without the precaution of making their aggregate sectional area as small as that of the main pipe (Fig. 133).

In the Chilson Furnace (Fig. 134) the means adopted for equalizing the ascent of the smoke in the various upright flues is the tapering of these flues as they ascend. Where they join the horizontal ring above, their aggregate sectional area is but little greater than that of the main flue. This method, however, has the disadvantage of presenting a retreating surface to the ascending air current. A horizontal pipe presents but one side to the ascending air current, and therefore is less effective in heating it than a perpendicular pipe, which may be entirely surrounded by the air. The conical surfaces of the pipes of the Chilson Furnace are open, in a certain degree, to the same objection. If the cones were inverted the fresh air would impinge with much greater force upon their surfaces. But such an inversion would expose them to the danger of clogging by soot. Moreover, the tapering of the flues, whether upwards or downward, diminishes their actual superficial area and consequently their heating power. Some other method should be adopted for regulating the current, not open to these objections. The pipes should be so arranged that they may be easily cleaned, yet so formed that frequent cleaning would be unnecessary.

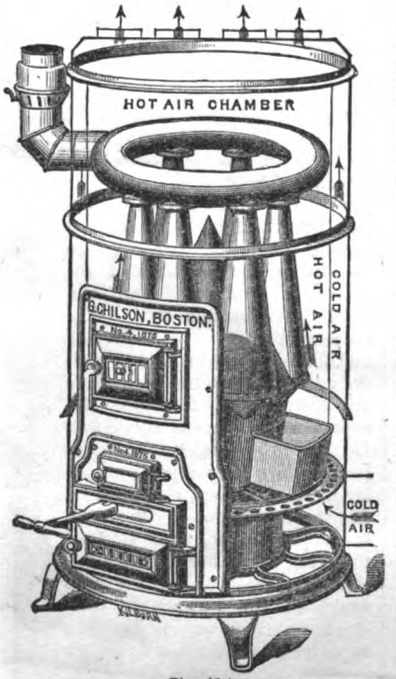

Fig. 134.

Finally, furnaces may be again subdivided into various classes, according to the material of which they are constructed.

THE ILLUSTRATIONS.

THE CONNECTICUT THEOLOGICAL INSTITUTE, HARTFORD, CONN. MR. F. H. KIMBALL, ARCHITECT, HARTFORD.

An account of the manner in which the architect and his original design were treated by the building committee, together with a description of the building, will be found in our Hartford correspondent's letter in the *American Architect* for September 13, 1879.

TOWER OF THE CHURCH AT SAINT QUAY-PERROS, FRANCE.

We reproduce this engraving from the well-known French journal, *La Revue Générale de l'Architecture.*

HOUSE FOR A. L. RAND, ESQ., NEWTON CENTRE, MASS. MR. C. A. RICH, ARCHITECT, BOSTON.

The inside finish of the principal rooms on the first floor is to be in hard wood. Elsewhere it is to be in pine.

PICTURES OF THE SEASON IN NEW YORK.

Annual exhibitions, composed principally of the works of our own artists, absorb our attention in the spring. But at this season we turn — perhaps as eagerly — to the picture-dealers and their recent importations. The entertainment they offer us this year is too good to be passed over without a word of approval. What Thomas has done for music in New York, the dealers have, to a certain extent, done for painting. They have kept a step ahead of the public and educated it gradually to the appreciation of their best wares. It shows a notable advance in the last few years, when we find them now offering with confidence the actual cream of modern achievement. The best works of the noblest brushes are now admired, — and bought, — and works of talent with unfamiliar signatures are no longer always dreaded as dangerous experiments by the purchasing amateur. Of course "popular favorites" of long standing are still in force. Bouguereau, Seignac, Verboeckhoven, Meyer von Bremen, Frère, are not yet out of date. Still it is an encouraging fact that Bouguereau's large and showy Charity has hung for a year at Goupil's, while the famous Mare aux Grenouilles of Diaz — as fine a landscape as he ever touched — was in M. Schaus's hands a few days only.

The dealers do not show us their whole importation at once, but the samples already exhibited contain some of rare quality. The most striking canvas at Goupil's is a large winter scene with a three-horse sleigh, by the Pole, Chelmonski, one of the very newest of Parisian lights. It is a powerful picture, and a strange one, strong rather than beautiful, realistic, yet without elaboration of detail, and full of tremendous life and motion. The technique is most peculiar. We have all seen "broad" work, surely, of many kinds in recent years. Chelmonski's is not as broad or dashing as some, but is fiercer, more brutal, if I may so speak, than any I remember. There is great power of characterization in the faces and very good painting in the shying horses. Of color, sought for its own sake, there is little, and of "tone," similarly sought, no more. It is the vivid reality of the work that impresses us. It is like a fierce bit of bravura playing where we think less of the theme than of the marvellous manual audacity that renders it. Such a picture is in the strongest possible antithesis to the Schreyer that hangs opposite, — mild and luxurious-looking, in spite of snow and shaggy coats, everything else being sacrificed to "tone" and the chord of softest browns and grays. The other good pictures in this room do not need special description, for they are by better known hands. There is an admirable de Neuville, with four figures, — one of them a portrait of General Ducroz. The picture is remarkable for its artistic balance and repose, and for the perfect atmosphere. A large Ziem is a good example of his brush, and gains by varying from his most mannered work. The color is wonderfully rich, though perhaps not equally harmonious, and the fantasy of the usual Venetian scene is sobered by the heavy foliage of the foreground, which is, by the way, very cleverly done. Daubigny and Diaz are represented by average specimens, and among two or three Corots there is one, the smallest, that is very lovely. It is said to have come from the studio of Daubigny, to whom it was given by the artist. A large canvas by Mr. Joseph Jefferson, besides being poor in itself, well exemplifies the difference between an original talent, like Corot, which paints nature as it sees, and a man who strives to paint nature as he imagines Corot to have seen it. There have been rather too many such about of late. We turn with delight to another first-rank man, Anton Maure, who has here two fine landscapes, with sheep, remarkable for distance and atmosphere. Such pictures are an earnest that the poetic and truly artistic school to which they belong is growing into favor with us. What would the buyer of, say, fifteen years ago have said to Maure? Another very good thing is a tiny cattle piece, by

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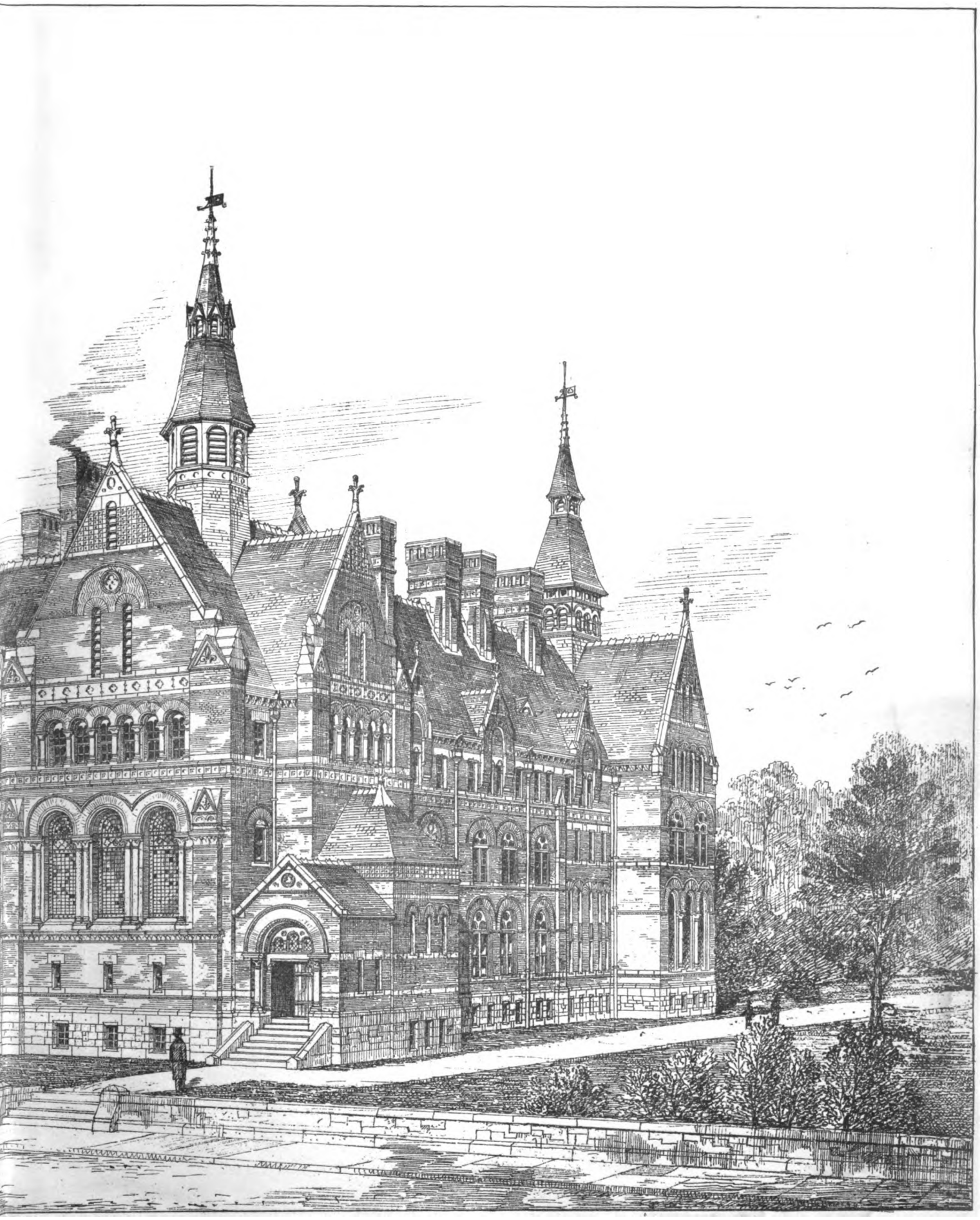

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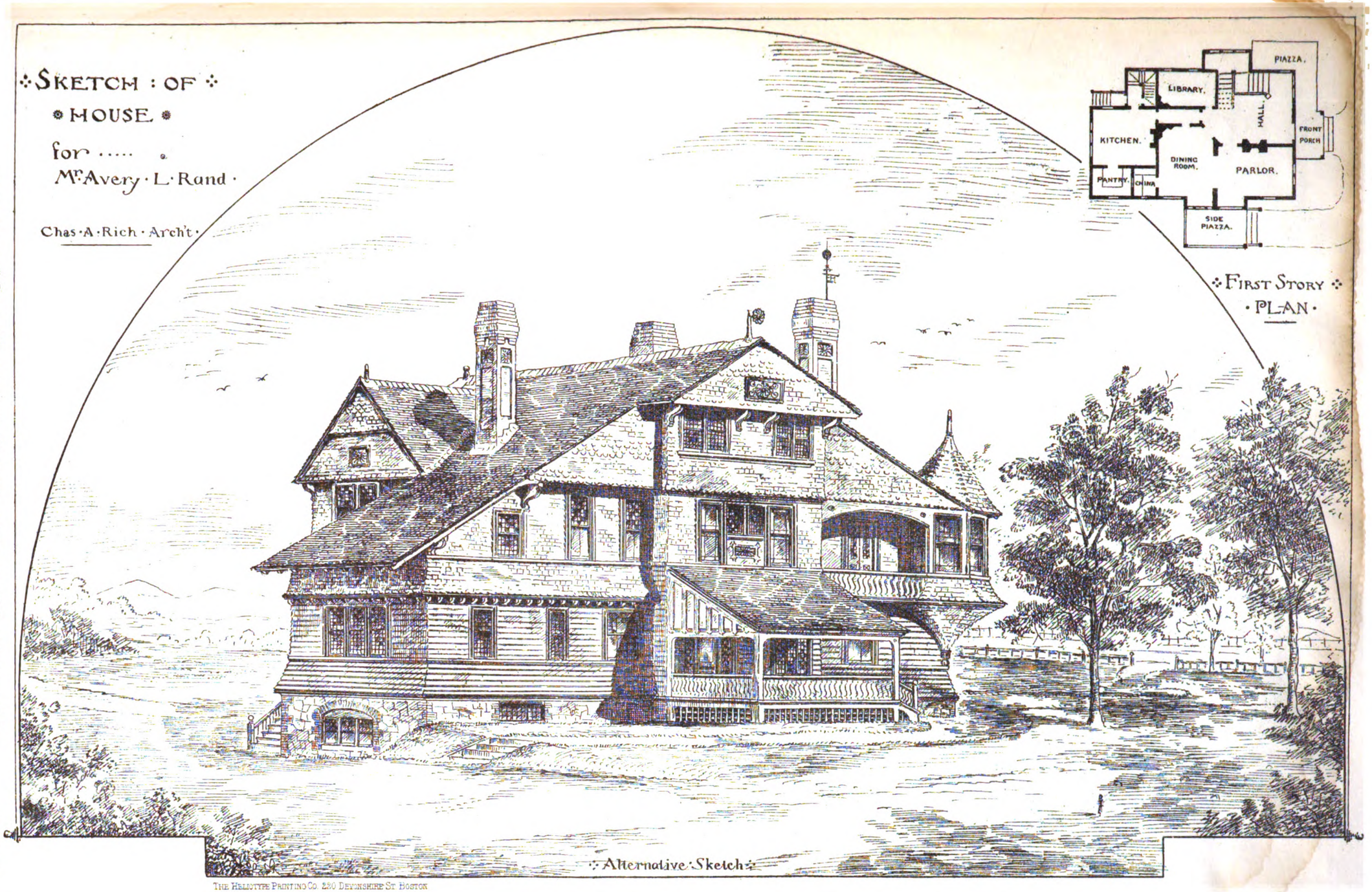
American Architect and Building News Nov. 15. 1879.

№ 203

Sketch of House for ..... Mr. Avery L. Rand

Chas. A. Rich, Arch't.

First Story Plan



Alternative Sketch

The Heliotype Printing Co. 220 Devonshire St. Boston

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F. Huguelin, archte del.

Revue Générale de l'Architecture

The Heliotype Printing Co. 220 Devonshire St. Boston

Church at St Quay-Perros, France.

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van Marcke; and Gros and Gués have each a clever small figure in their well-known styles. The Gués would be a fine little spot of red to hang in a corner now too sombre. There is furthermore a good and dramatic bit of military painting from the brush of the Prussian Hünten, and also one of Knaus's sought-after heads. This time it is a laughing boy, a *replica* of the head of the principal figure in a large picture called, I believe, The First Earnings.

Mr. Avery's gallery contains a fine still-life by Robie, where he abandons, with profit, I think, his usual amount of crimsons and pinks, and gives us a scale modulated on the brown and gold of the pheasants that are the centre of his group. A good thing is the head of a sleeping child, by Defregger, — not idealized in the least, nor picturesque, but truthful and realistic in the best sense. It is interesting to see a large study head from Vibert's brush, very different looking in its rapid breadth from his small, finished pictures. The violent flesh-tints in which he indulges are more noticeable here and make us quite content that he should always give us only cabinet pictures. I noted, also, a very good Clays, a large and poor Escosura, and two pictures of single figures, by Boughton, which are neither like life nor like any artistic ideal whatever, — melancholy ghosts of most unbeautiful women. Further, a small Bridgman, painted last year, two Orientals playing at draughts, in which color and texture are better than the attitudes. A new name is that of Kowalski. The Sclavonic element in continental art, it may be noted, is becoming very conspicuous, and seems always to be powerful. This is most unlike the work of his countryman, Chelmonski, but also good, — a clever, highly-finished cabinet painting of horsemen in armor, in the street of a town. Another new name — to me at least — is that of E. Villa, whose Japanese Lady is clever. The mass of red drapery is very well managed, and the head admirable for expression and finished flesh painting of the ivory-like kind.

At Mr. Schaus's gallery there is a Joan of Arc, by Jacquet, a full-length figure, which is not satisfactory. The pose is ungraceful, and the head, though of course beautifully painted, is most uncharacteristic. On the other hand, a large picture called The Angelus, by Merle, a single figure in a mediæval dress of beautifully contrasted tints, shows this artist at his best. He is out of favor, of course, with the admirers of more recent fashions of working, and with those also who look for strength of some kind as a necessary factor in art. But the many who do admire him will agree that his virtues are well exemplified here. In this gallery we find another fine Clays, an exquisite little water-color by Celestin Nanteuil, and a good single figure by Palmasoli. This last is noticeable, as the Spanish school seems yet a good deal out of favor this year. But can we complain when we get instead a large number of works from the very best modern Frenchmen? I have already spoken of Diaz's Mare aux Grenouilles, which was recently sold, as was also a large Dupré with an oak tree. And no one would ask for any canvases of the recent "chiffoné" school before the superb calmness of a small Dupré and a Daubigny Mr. Schaus now exhibits. I do not know whether a large Lambinet he had a few weeks ago has been purchased or not, but it was a fine thing. Better yet is a Corot, a square picture with a distant glimpse of the Mediterranean. No finer sample of his power has come to this country. It dates from about ten years ago, and would be a revelation to many who think they know what a Corot means. As I said long ago, in speaking of the master's Orpheus, it is magnificent poetry, not substituted for the painter's art, but expressed by means thereof in the most admirable way. It is a picture to confute at once those who prize prosaic "truth to nature" as all-sufficient, and those who are satisfied with an "idealism" that scorns artistic aims and methods, and can pass over the absence of good painting in a technical sense for the sake of certain imaginative qualities indicated rather than legibly expressed. But the gem of this year's importations, as far as they have yet been shown us, is without doubt the Diaz figure-piece in Mr. Schaus's possession. Like Corot, Diaz was very unequal, and like Corot, again, there is a poetry and an artistic force in his best works unsurpassed by modern brushes, undreamt of by many who are even well acquainted with his lesser works. I myself lived years in a house with three of Diaz's figure-pieces, and very good ones, but found here something different. It is not in the decorative style he often chose, with its rich and dazzling, but sometimes over-vivid, color. It is far beyond the mediæval or Boccaccio-like picnics that are, indeed, so delicious, — still farther above the so-called Turkish groups, like the one, for example, that we saw in the Spencer collection last winter. This picture, which is larger (24 × 30) than most we have seen on this side the water, contains seven figures of nymphs and cupids in a landscape that is noble beyond description for composition and color. The figures are more carefully drawn than is usually the case, and the coloring, equally rich, is more sober, more permanently delightful, more in keeping with the perfect classic spirit that has inspired the whole. I do not mean that it is the actual classicism of the antique, but the equally artistic though different classicism of Italy in the early sixteenth century. It is a belated Venetian or Parmesan of the *Hochrenaissance* that has dreamt such a dream, that has wielded such a brush as this. One who has seen but the average of modern work, to whom the average modern spirit seems the incarnation of all our artistic possibilities for the future, will scarce believe how near one of us has come to Correggio — to his conceptions, and, in a way, to his very workmanship. I may seem over-enthusiastic, but this is in very truth a most unusual picture, one that should not be allowed to pass into private hands, while there are empty museums that might offer it for public delight and improvement.

The first sale of the season has been that of the Gilbert collection, mainly of English pictures. Most of them were by men very mediocre, even in their own school. There were several fair Hillingsfords, however, and by Thomas Cooper a finished sketch for his large picture, Sheep in the Highlands, that was at the last Paris Exhibition. The effect of light on the snow was very good. Douglas, a pupil of Landseer, who is, I believe, very well thought of at home, had two pictures which scarcely justified the fact. In the attempt to render the texture of dogs' coats his brush-marks looked simply like brush-marks, and not much like locks of hair; a fault, indeed, not wholly absent from the work of his master. There was also a small Mulready, — was he not a sort of less delicate and less technically-accomplished Meyer von Bremen? — and an Ansdell, very crude in color. It is such pictures as this that are so unpleasantly surprising when one has already known their engraved reproductions. Which one of us who has studied the beautiful Vernon Gallery plates, for instance, on many a youthful Sunday afternoon, but has felt the bitterest disappointment when he hurried to their originals in the National Gallery? This Ansdell would make — probably has made — a lovely engraving, but I should hate to be forced to look at the original day by day. It is the pure skill of the painter that is most lacking to Englishmen of the olden school, — the power to make their picture an admirable object to the trained eye, a sensuously delightful object to every eye, whether trained or not. These are trite conclusions, of course, but they come to one with fresh force at the sight of every group of English pictures. The actual faults of their technique are of two kinds. On the one hand there is the hard, tinny, absolutely unartistic style, which was exemplified, to a degree, in this Gilbert collection by the Herrings, father and son; or, if I must give names of higher rank at home, by such a picture as Mr. Marks's Falstaff's Own. It may be remembered that Mr. Ruskin once said that Marks's painting was of "good standard modern quality," which proves pretty well how low the English standard has been. When we leave this hard and wooden style we come, on the other hand, to pictures that are soft, textureless, and "mushy," if the word be allowed. They look as if there were in all nature nothing solid as to substance or definite as to color. Such a picture in this collection was Mr. James Webb's large Vale of Ross, a mass of soft and mossy-looking colors, without clearness of handling or unity of tone. Among the few continental pictures there was, by the well-known Pole, Jos. Brandt, a large camp scene of the seventeenth century, such as he so often paints. It was marvellously well done for the style of work, many small figures, exquisitely drawn, the coloring being good, but not pronounced, holding, as in so many German pictures, the second place only, being used as an accessory to further define the elaborate drawing. One may say that a painter should be, first of all, a colorist, yet such a picture as this is undeniably artistic, and one sees how good a technical artist the painter is by comparing it with the canvas of Mr. Marks, already referred to. Finally, there were two Tissots, interesting, as usual, and showing the usual curious effect of French modes of seeing directed upon English objects. His coloring is scarcely such, it has the pale and shallow look of pastel, and is kept so near to black and gray tints as to be almost monochrome. Hence a sudden bright touch, like the yellow flower in A Honeymoon Tiff, does not enliven so much as jar upon the general effect. The large Morning Call, which is so fascinating, because so prettily and characteristically modern, in the beautiful reproduction of the print shops, did not win much added admiration when seen in the original. It was a study in black, with a white background, and here the too sharp note of color came in the red lips of the scarcely more than tinted face. The brush-work was very clever, of course, and there is no one who gives a sort of boudoir and conventional beauty like Tissot without falling into the insipidity of a Toulmouche. It is hopeless, perhaps, to protest, as has so often been done, against the stupid and exasperating English device of covering oil-paintings with glass. If it is necessary to protect the surface from a smoke-laden atmosphere, they may be put in boxes, and the lid opened when the picture is examined. Many delicate pictures in European galleries are thus protected, a precaution that is often annoying enough; but to put a glass under the frame flat upon the paint is simply heathenish. All possibility of judging either methods or effects with accuracy is lost, and the better the light the less well one can see the canvas. Besides all which it is a process often most detrimental to the state of the picture itself.

I may note, in conclusion, that the famous Deux Vanderveldes of Meissonier will shortly be on view at Mr. Schaus's, and that Munkacsy's Milton and his Daughters has passed into the guarded semi-publicity of the Lenox Library.

M. G. VAN RENSSELAER.

GLASS PAINTERS' CENTENNIAL. — The nine hundredth anniversary of the discovery of the art of painting on glass has been celebrated at Tegernsee, the Bavarians claiming the invention for the Benedictine abbey there. Professor Sepp wrote a pamphlet for the occasion, maintaining the assertion. Four stained windows were unveiled in the church of the village, which have been put in to commemorate the event.

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CORRESPONDENCE.

THE CATHEDRAL. — ST. MARY'S IN THE CAPITOL. — THE CHURCH OF THE APOSTLES. — ST. MARTIN'S. — ST. GEREON'S. — CIVIL BUILDINGS.

COLOGNE.

COLOGNE is a thoroughly German city, though on the left bank of the Rhine, and though its famous scent has carried a French name to all parts of the civilized world; only a small part of this "eau de Cologne" is, however, made here, and probably its origin is forgotten by many besides the bluff Englishman who, breaking down in his French in a shop, went helplessly away because he did not know what they called "eau de Cologne" in France! But for us the city has another interest, its cathedral forming one of the land-marks in our architectural horizon, as the finest Gothic monument of the Teutonic race. The city lies in a half circle on the Rhine, here a wide and noble river, and its aspect from this side is imposing, with the great cathedral towering grandly in its midst. The two huge spires bristle with the ponderous scaffolding which is slowly carrying them to completion. They will then be one hundred and fifty-six metres (507 feet) high, slightly higher than the iron spire of the Cathedral of Rouen, now the highest spire in Europe. With the exception of about a fourth of these spires yet to be finished the building stands a perfectly completed cathedral, very nearly such as it was first designed in the middle of the thirteenth century. In this respect it is a rare example, for few cathedrals have ever been completed, and still fewer in one style. Each generation continued the great monuments with the methods familiar to them.

Standing free on all sides, the cathedral is seen to advantage; the view of the apse, with its girdle of flying buttresses, is especially fine, as the ground there falls away to the river. A description of the exterior is superfluous, as photographs and engravings render it satisfactorily, and, unfortunately, the cold greenish gray of the stone does not diminish the dryness which seems inherent in all the Geometrical Gothic work of Germany. This dryness, which the picturesque stains of time do not efface, is almost the only defect in this magnificent composition. The proportions are admirable, and the rich details skilfully placed and subordinate to the masses, and there is hardly a Gothic church which presents so few errors or vagaries in design; and yet this splendid completeness inspires admiration rather than enthusiasm, and more wonder than interest. Many smaller and less perfect churches are more impressive, while this, because there is a flavor of the T-square and compasses about it, suggests an immense model. There is nothing of the spontaneous grace so charming in French cathedrals, which throughout, down to their smallest details, breathe a personal artistic inspiration, or rather the inspirations of many artists. The varying humanity thus wrought into Gothic work gives it a peculiarly sympathetic quality, and this is by no means incompatible with symmetrical and homogeneous design; though the latter is more often found, as more easily obtained, when one mind controls and develops the work throughout.

In the interior this dryness is less evident, especially when its mechanical triumphs are warmed by the colored rays from the vast windows. Six wide and lofty bays in the nave, with rather late crockets on the archivolts, support the triforium gallery, which has four slender arcades to each bay. These arcades are divided by delicate round mullions, and the outer wall is pierced with similar arcades with coarse mullions. It is rare to find thus the wall of the triforium pierced and glazed, but the effect is fine; a great additional surface for stained-glass is gained, and at the same time the triforium gallery is preserved to give light and shade, and by revealing the thickness of the walls relieves them of the cardboard look which their clerestory walls must have. The choir was begun in 1248 and finished in 1322, and the nave, though later, was carried out in the same style. The bays of the choir are stilted, and of half the width of the other bays. The spacious double aisles are carried around the transepts. The vaulting is the simple quadriparte, and in the aisles remarkably concave. One of the most beautiful effects of the church is the slender shaft of the nave-piers, which, rising from the floor, supports the central vaulting rib. The glass through the triforium is new and innoffensive rather than good. The clerestory has old glass of a greenish tone. Many of the windows of the aisle are new, and come from Munich, Berlin, and Cologne, but none of it is comparable to the best English work. Their mediocrity becomes painful beside five great windows of the north aisles, painted in 1508–9, and splendid examples of that period. The *chevet* has seven chapels with tombs, — interesting to the historian rather than to the architect. The sacristy contains a fine collection of altar ornaments.

The dimensions of the building are about (I say "about" because it is rare to find authorities agreeing on the dimensions of any building) 136 metres long by 61 wide, and 86 across the transepts, height 44 metres. There are six bays in the nave, and four in both the choir and transepts. It will thus be seen that the nave is very short compared with the other dimensions, and this is at once felt, on entering, to be a radical fault. The great height and width of the nave, further exaggerated by the double aisles, require a long nave, from which the lofty transepts would gradually open. As it is the transepts attract the eye at once, on entering, and the nave is so short and high that it is hardly seen at all. To remedy this, works are now in progress by which the great porches in front and those under the towers will be thrown into the nave, and thus the latter will gain two bays, which will, however, but partially relieve this defect.

The very completeness of the cathedral, which leaves little to explore, will cause it to hold the attention of the architect less long than some of the parish churches scattered about the city. These are chiefly Romanesque or Transitional, and are of vital interest to our modern architecture as examples of a noble style, whose development was suddenly cut short by the Gothic fashion, and which, therefore, offers to us data from which to develop a new and characteristic style, should we find it applicable to our wants: and this cannot be the case with those styles which reached a complete development, and passed into a decadence. The oldest of these churches is St. Mary's of the Capitol, consecrated in 1049, but whose nave and transepts date from the twelfth and thirteenth centuries. The most striking features of the façade are the two circular transepts, which, as well as the central apse, are surrounded by a beautiful open gallery under the eaves, and this, which is a characteristic of all the Romanesque churches upon the Rhine, recalls the black-and-white marble architecture of Northern Italy; but here in the north, where the shadows are more rare and uncertain, this vigorous accentuation of light and shade is the more admirable. The effect of the three semicircular apses is very robust and grand without; within it is more open to criticism, as diminishing the value of the central apse; yet these three apses, around which aisles are carried, give a splendid richness to the east end of the church. Over the crossing of transepts and nave is a flat dome. A characteristic of this group of churches is the slender detached coupled columns which support the arch-walls of the round-arched clerestory windows in the apses. These churches are almost without chapels; in this case there are but two, placed at the east corner of choir and transept. The square piers supporting the round arches of the nave are almost as wide as the spaces between them.

The apses have plain barrel vaults, and the nave an early thirteenth century pointed one. The entire church has lately been decorated with Byzantine scroll patterns; their dull yellows and bluish greens are, however, not agreeable in tone. The Church of the Apostles, in the same style, has a finer exterior than St. Mary, and is seen to better advantage. Its three great circular apses, separated by two square towers, viewed from a large square, are very grand. A dirty coat of whitewash disfigures the interior. The nave crossing is here raised upon a drum, but otherwise the design is much the same as that described above. St. Martin's, though dating likewise from the twelfth and thirteenth century, preserves the Romanesque throughout its interior, and has been lately decorated with extraordinary success. The walls of the aisles are covered with a double range of figures upon a Venetian-red ground; from their archaic character they appear a restoration of remains found there. Aisle-vaults and nave-piers of greenish stone color, nave-vaults of blue, with bold central motives of red on a light ground. In the apses the colors are intensified, and powerfully contrasted with black shafts of a mural arcade below and those of the clerestory. Between this arcade and clerestory are a series of heads of prelates. The effect is very fine. Few colors are used, and those disposed so as to produce a cool, quiet general effect, though rich and warm in detail. Instead of two towers at the angles of the apse, this church has a very fine tower and spire over the nave-crossing. These three churches are fair types of the Romanesque churches scattered along the Rhine. Their three circular apses relieved by the rich arcade under the eaves, through which is often seen the apse vault, as in Italy, their solid walls pierced with few windows, and firm square towers render them impressive from the first; while their dignified simplicity is a beauty which gains on nearer acquaintance. They all have remains of good early glass. Besides these and other churches, Cologne has one which is unique in its character: St. Gereon consists of a large decagon dome of the thirteenth century, attached to a choir dating from 1069. The decagon, with radiating chapels, is lofty and brilliantly lighted, and forms an impressive contrast with the severe choir, in whose sombre shadows the high altar rises dark against the narrow windows of the apse. The high altar deserves the name, for not only is the whole choir raised some five metres, but the altar, again, is well elevated above it, and this produces a grand effect. Indeed, nothing can be more solemn than this elevating the altar. No wealth of carving nor ornament, no pomp of marble nor baldachin, can equal the solemnity of the simplest altar, if lifted high above the body of the church. Add to this that the ceremonials of the church are vastly more imposing when thus high above and in full view of the people, and it seems extraordinary that this simple and natural position of the altar should not have been more commonly adopted. The Gothic architects, with all their keen appreciation of the picturesque, turned this to but slight account in comparison with the splendid possibilities open to them in their long and lofty choirs.

Their attention was too often directed, like that of the Renaissance architects, to raising a canopy above the altar. There are examples, as St. Miniato at Florence, where the choir is raised simply to obtain a crypt below; even then, if the choir is deep, the altar is rather hidden than raised high enough to give the effect of which I speak. Here at St. Gereon's there is a crypt entered at the side, instead of, as is usual, in the centre, between the two flights which ascend to the choir; but in all these Rhine churches, with or without crypts, there

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is a marked intention to elevate the altar, which was lost sight of in the Gothic style which superseded this architecture.

Of the civil buildings in Cologne the city-hall claims attention first, with a fine square tower of the rich Gothic of the beginning of the fifteenth century. One of the façades has a Renaissance portico of the sixteenth century, pleasing in some respects, but whose entablature with rude heavy consols hardly merits the praise which Mr. Fergusson awards to its design. Within is a hall of the fourteenth century with pointed wooden vault. But this hall is eclipsed by the magnificent one in a building near by, of the fifteenth century, called the *Gürzruich*. What changes were made in restoring it in 1856, I do not exactly know, but as it now stands it is 57 metres long by 22 wide, and 14 metres to the top of the handsome hammer-beam roof. There are spacious galleries at the sides, supported upon 22 wooden columns. The wood is simply oiled and picked out with gilding, and this makes an agreeable harmony with the dark green walls.

Coming down to the present day, the museum represents the modern Gothic. It was built in 1861, at the expense of a wealthy citizen. As might be expected, the style is dry and unpleasing, but the plan is good. It contains fine collections of Roman and mediæval remains, and a large collection of the old Cologne school of painters, as well as modern pictures. The staircase-hall opens from the central vestibule, giving access to galleries on each side, and has a graceful pointed dome, with delicate ribs rising from slender engaged colonnettes. The engineering glory of the city is the railway bridge, which has also a road for carriage traffic. It is of iron trestlework, and measures 412 metres. As for the new private buildings, they show no especial character, being either of the early German Renaissance, or else of a bastard Gothic; but they are well built. The city is a fortress of the first class, and counts among its 135,500 inhabitants 7,000 soldiers in garrison. R.

BRICKLAYING IN FRANCE.

[We owe to the *Architect* the following extracts from one of the artisans' reports on the French Exhibition of 1878, which were prepared, as we understand it, by the authority of the Society of Arts.]

BOTH in Paris and in the towns and villages outside, bricklaying seems to be the work of only two schools of bricklayers of definitely fixed methods. The sameness of execution and sameness of design in these two typical methods is very remarkable. The execution consists, without exception, in laying the bricks in mortar, in a manner known as "left for pointing," and in afterwards stopping in the joints, and laying on, with a three-eighth-inch jointer, a white joint in either plaster or putty. This is the method adopted for the best description of work. The only other mode of finishing the face-work consists in laying the bricks as in the first instance, and then stopping in with white stopping. The whole is afterwards colored to the required shades, and the joint brought out white by ploughing into the stopping with a jointer run along a "straight-edge" rule, to the depth of about one fourth of an inch. The width of the joints is about three eighths of an inch, alike for the bed and cross-joints.

In laying bricks for pointing or external plastering, the French workmen make no attempt to "fill the joints," but leave them gaping and open to a depth of about three fourths of an inch, so that no "raking out" is required. Such performance would not be sanctioned by an English clerk of works, or suit the taste of English bricklayers, although, it must be confessed, a better key for either stopping or plastering is thus obtained than by the "raking out" process. Whether the French have borrowed or adopted "tuck pointing" from the English I cannot say. They call it "English jointing," or *joint anglais*. In my opinion a good lesson might be learned from them if their mode of mixing, and the materials which they employ, could be accurately ascertained. The joints have a glazed appearance, and are very hard; and I have not noticed a single instance in Paris of the crumbling away or falling off of the joints, so frequently seen in England.

This may, in some measure, be due to the difference in the action of the two atmospheres, or to the less frequent sudden changes from soaking rains to freezing which occur in Paris. Whether this be the case or not, I am convinced that the more capillary absorption is avoided, by the employment of materials of a more dense and less porous nature in the construction of joints, the less will be the subsequent disruption of our work by the expansion of the water lodged in the pores upon the occurrence of freezing. From what I can make out by the examination of both old and new work, the durability of the French pointing is due, in a great measure, to the employment of a more dense and consequently less absorbent material than we use, and to the giving a better key to the stopping, by the method of leaving the joints open, as has been described.

The only artistic effect produced in brickwork, in Paris, is the almost universally adopted checkered, lozenge-shaped, and square patterns, which are supposed to be done in various-colored bricks, namely, light, dark, red, and blue; but which is not unfrequently the work of the pointer, or of the painter, rather than the laying in regular bond of a design in brickwork by the bricklayer. Such artistic work and careful execution as is instanced in the red brick mansions of the "Queen Anne" style, and other buildings in brickwork in England, where the geometrical knowledge, the artistic taste, and the neat workmanship of the English bricklayer is exemplified with such pleasing effect, is not easily to be found in Paris.

The extent to which ornamentation in bricks and artistic brickwork is adopted by French architects may be fairly judged, since it may be assumed that France, as a whole, is represented at the Exhibition. If any steps had been recently taken to improve the French style of brick buildings, this would certainly have been shown there in some way. I have also examined drawings in the architectural and civil engineering departments, and although these indicate a tendency to more general use of bricks in the provinces, in prison, school, and dwelling-house architecture, yet nothing appears in this material in the way of mouldings, cornices, caps, gauged arches, niches, scrolls, or carving, as is seen in almost every town in England, to a greater or less extent. In fact, ornamentation in domestic architecture does not seem to run very high in France, so far as I could judge from what I saw of Paris, and the few places outside its walls which I visited. The French appear to delight in decorating their public places and edifices to any extent, but do not apply the same rule to their houses, and are therefore very unlike the English, who take pride in the appearance of their homes. This is the cause of the variety of styles, and of the competition in street architecture in England.

The rate of wages paid to the bricklayer in Paris is 70 centimes per hour (7*d*. English) for journey-work. The hours of work are from 6 A. M. until 6 P. M. under one method, and from 6 A. M. until 5.30 P. M. under the other, there being a movement started in Paris which aims at the reduction of the hours of labor. Work is carried on on Sundays the same as on other days. The hours made during the week are 77 under the first and 73½ under the other system. The earnings of the bricklayer in Paris thus amount to 53 francs 90 centimes for a full week of 77 hours, or £2 3*s*. 1½*d*. of English money. For 73½ hours the sum is 51 francs 45 centimes, an amount equal in English money to £2 1*s*.

I understand that a bricklayer will execute about two metres cube of brickwork in a day. That would be equal to laying 990 bricks in 11 hours. This number is less by about 300 to 400 in the 11 hours on similar work as compared with the day's work of the Englishman. I very much question, however, the exactness of this statement from the little I saw of the French mode of bricklaying while at Paris, and from the experience I have had of working with them in Portugal, for about three years.

The cost of bricks per 1,000 in Paris varies from 55 to 64 francs according to quality. The sizes of the ordinary building bricks are somewhat smaller than ours, being 8⅞ inches by 4¼ inches by 2¼ inches approximately, and compared with ours for prices are somewhat cheaper, stocks in London now being about 50*s*. per 1,000 for seconds, while bricks of the second quality in Paris are 60 francs or 48*s*. per 1,000. Fire-bricks (black) are 70 francs, Bourgogne 85 francs, *refractaires* 100 francs per 1,000.

Tiles range from 50 francs to 105 francs per 1,000, or 40*s*. to 84*s*. The first is the price of the ordinary *carreaux à pans rouges* of first quality, or red tiles, the second that of the white Bourgogne tiles.

Portland cement, or *ciment Passy*, which is similar to it, in Paris is 6 francs per 100 kilos, equal to about 2*s*. 4¾*d*. per bushel, weighing 110 pounds, or 4*s*. 9½*d*. a sack of 2 bushels. Roman cement is 5½ francs the 100 kilos, or about 4*s*. 4½*d*. the sack of 2 bushels.

One cubic metre of lime costs 21 francs, which would be equivalent to 11*s*. 9*d*. per cubic yard.

Plaster of Paris is 18 francs the metre cube, or 27½ bushels. Therefore a 2 bushel sack would be about 1*s*. 2½*d*. This price, as compared with ours, seems incredible, being only one fifth of the price charged in England. The cheapness of plaster may account for the almost indiscriminate use of it in building operations. I noticed that the French plasterers do their pricking up with plaster, and use only about one fifth the quantity of laths we do, theirs being nailed about 4½ or 5 inches apart. The ceilings are pricked up, or rather pugged in, on a boarded sheeting, fixed up under the laths, which is afterwards struck, and the finishing done from beneath with plaster also. Brick and stone work is also done in plaster and sand, and external plastering to a very large extent. The plaster comes from Montmartre, Marly, and elsewhere. The depot is on the Quai Jemmapes.

The tools of the French bricklayer differ only in the trowel and mortar-trough. The latter is the same as used in some parts of Scotland, and with mason's fixers, and is similar in shape to a washing-tray. The French trowel would, undoubtedly, be an awkward tool for an English bricklayer to use, as it cannot be employed for cutting or trimming bricks, a process which is accomplished by another tool, the brick-hammer. The spreading the mortar and cutting are both done in England by the trowel, which may be said to serve the purpose of hammer and trowel as well. The French tool seems to be made to suit the trough, rather than for laying bricks and "striking joints." There is a peculiarity about the French laborer's hod, which I saw in use on the ground only; whether it can be carried up a ladder I cannot say. It consists of boards put together to form sides about 1 foot 10 inches by 1 foot 2 inches. These are set at right angles, like the bottom and one side of a box. The side which forms the bottom is then fixed upon two short poles, one to rest on each shoulder, and be held by one hand. The side which stands up prevents the mortar, which is loaded on by an assistant, from slipping down about the bearer's neck and back. There are two brackets fixed to the under side of the poles, which, bearing against the back, serve as stops to prevent this clumsy implement from slipping forward. I

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say clumsy, because it cannot be used by less than two men, one to fill and the other to carry. It may be possible that more stuff could be carried by it than by the English hod. But the way in which I saw it loaded did not seem to indicate that it was customary to overload the bearer.

THE NEWLY DISCOVERED ROMAN FRESCOES.

The Roman archæological commission has had a ground plan taken of the ancient Tiber house, and one exactly like it is to be built on the grounds of the botanical garden in the Lungara. On its walls are to be placed the lovely frescoes, and in its rooms will be arranged all the articles of art value, found in the Tiber. This house will be the Tiber museum. I have already described these much-talked-of frescoes at length in preceding letters. Every day their value seems to increase. To be sure, a good part of this admiration among officials must be set down to the desire to exculpate themselves for putting in peril the works of Raphael and Sebastien del Piombo; but at the same time it must be admitted these ancient frescoes do possess an indescribable charm, an exquisite feeling for harmony of color, and a close attention to general architectural effect. Some artists of distinction tell me they are much finer than any ancient works of the kind yet found. They have been removed with great care. Artists employed at the Pompeian excavations came to Rome to superintend the delicate work of lifting them off the walls. Cavalier Massuero took drawings from them, which will be published in the monthly "Notizia" of the Lincei Society.

These frescoes give three styles of painting, — light figures on a light ground, on a red ground, and on a black ground. The little squares with girls seated in the open air near Hermes, playing with rabbits, are regarded by artists as the most beautiful of all the frescoes. In the landscapes of this house we have undoubtedly the works of Ludius, the artist of whom Pliny writes. They are the "*varietates topiorum*," as the ancients called such pictures, — a sort of scenography. Ludius, we are told, was a great dandy, and dressed in a fantastical way. — *Boston Daily Advertiser.*

CLEOPATRA'S NEEDLE.

To the Editors of the American Architect:

Dear Sirs, — Has the *American Architect*, the organ of those whose main business is construction, not destruction, setting up, not taking down, no word of protest against the taking down of Cleopatra's Needle? What single point in history is so marked as that with which the second setting up of this obelisk coincides? The Empire of Egypt, the source of all knowledge, science, and art, ends. The Empire of Rome, the source of those administrative ideas which color all our lives and politics, begins. The Jewish nation expires. The Old Testament is finished. Jesus Christ is crucified. The Christian Era begins.

Such is the era in which this obelisk was set up where it now stands, whether that act was performed, as tradition asserts, by Cleopatra in honor of the birth of her child by Julius Cæsar, or, as held by others, in the reign of Tiberius Cæsar. What site can it stand on so significant as Alexandria, the port by which the Romans entered Egypt, the point of entry from the western to the eastern world?

When Cleopatra's Neeedle is taken down only four obelisks will remain standing in Egypt. None will remain standing whose interest for us resides, as does this, almost wholly in its standing where it has stood for nearly two thousand years. Its archæological interest received an irremediable wound when it was wrested from its original site at Heliopolis. That which it thus lost can never be recovered. Such interest as it has since acquired is a historic interest, not an archæologic interest, and resides in the fact of its second erection, and its survival so erected to our time. The interest of its standing nearly two thousand years in its present site, and all the associations of ideas which cluster around the era in the world's history in which it was erected there, will be lost when it is taken down; and that interest can, also, never be recovered. The case is thus wholly different from that of the obelisk rather meaninglessly set up on the Thames Embankment, and which many people are for taking down again and sending back to Egypt, for that was dug up out of the mud in which it had been half-buried and lost for centuries. The only honor which accrues to the English in that matter — that of recovering for the world something lost to it — will be wholly wanting to us if we set this obelisk up in the Central Park; while the dishonor and loss to the world attached to taking it down and removing it from its standing-place of about nineteen hundred years will be ours, and will be remembered against us as long as the obelisk stands or history survives. In the one case something lost is found. In the other something not lost is stolen, and in being stolen receives an injury which is irreparable.

Cleopatra's Needle is not the property of the late or present Khedive of Egypt; it is the property of the educated classes throughout the civilized world. But, though still their property after removal, it will only be a property by that act infinitely diminished in interest and value.

Edward T. Potter.

The Velocity of Wind. — On October 29, the wind at the summit of Mt. Washington attained a velocity of one hundred and thirty-two miles an hour.

PUBLICATIONS RECEIVED.

The Thirty-Sixth Annual Report of the New York Association for Improving the Condition of the Poor, for the year 1879, with a List of Members and Contributors. Organized 1843. Incorporated 1848. New York, 1879.

NOTES AND CLIPPINGS.

Fire and Burglar Proof Shutters. — A newly invented fire and burglar proof iron window-shutter was tested on the 13th ult., by fire company No. 6, corner Seventh and Olive Streets, St. Louis. The outward appearance of these shutters is the same as that of iron shutters in general use. Not far from the top of the shutter there is an open space with bars of iron across, in the form of lattice-work, through which a stream of water can be thrown from the hose below. This water falls into an iron sack or pocket, so arranged inside of the shutter in connection with a horizontal bar, and so connected with the bolts fastening the shutters that the weight of the water in the pockets draws these bolts, and the shutters, being hung on inclined hinges, open by their own weight as soon as the bolts are removed. The water is emptied out of these pockets by a plug in their bottoms. The test was applied several times, and all who witnessed the working of these shutters are said to have been entirely satisfied with the trial. Michael Peggot, an employé of the Rohan Brothers, boiler-makers, of St. Louis, is the inventor.

A Substitute for Hair in Plastering. — A vegetable fibre is now successfully substituted for hair in the composition of plaster for building purposes. The advantages claimed for it are as follows: First, being of a woody nature, instead of being destroyed when put in the lime, it is preserved, lime being a preserver of wood; second, it is light and bulky, so that one pound, costing but a small sum, is sufficient for a barrel of browning, and two pounds for a barrel of lime scratch-coat; third, it is much stronger than hair, is very light, clean, and entirely free from foreign substances; fourth, it mixes more easily and freely with the plaster than is the case with hair, and also spreads more uniformly through the same. This being the case, the new fibre is greatly superior to the ordinary animal hair; the latter, as is well known, usually containing some thirty per cent of its weight in impurities, — as lime and scrapings of hides, — while the hair itself, by the caustic action of the quicklime used in removing it from the hides, loses much of its original strength.

A Great Painting in Danger. — Andrea del Sarto's famous picture, known as the Madonna del Sacco, which was painted above the entrance door of the old church of the Annunziata in Florence, is said, by a correspondent of *L'Art*, to be in danger of serious injury. It is a case of bad water-pipes. The pipe outside the wall on which the picture is painted leaks so badly that infiltration has taken place in the wall itself; and so serious is the damage already done that, unless measures are immediately taken to remove the fresco, its complete destruction is inevitable. Already the head of St. Joseph "only exists as a remembrance," and the figure of the Virgin is "to be divined rather than seen." This state of things is aggravated by every day's delay, so that very soon, as the sacristan coolly informs his visitors, this magnificent fresco will probably disappear altogether.

Germania Victrix. — Schelling, the Dresden sculptor, has completed his gigantic model of the bronze memorial statue, which it was decided soon after the Franco-German War should be erected on the Niederwald near Bingen, as a lasting emblem of Germany's dominion on the Rhine. All the parts of it were recently conveyed from Dresden to Munich, where the work will be cast. They filled eight freight cars. When put together the figure will be 32 feet 9 inches in height, or a little more than one half the height of the famous Bavaria in the Theresa meadow near Munich. The work of making the casting has been intrusted to the Royal Bronze Foundry in Munich, and will consume, it is believed, two and a half or three years.

Searching for Pharaoh's Hosts. — The modern mania for archæological research, which has had such interesting results in Italy, Greece, and the Troad, exhibits its most magnificent development in the undertaking of the Abbé Meigne, who proposes, if he can obtain three hundred thousand francs, to undertake the disinterment of the hosts of Pharaoh, "because the finding of the remains of Pharaoh's army would be a powerful reason in favor of the truth of the Holy Scriptures." The course of the flying Children of Israel and their pursuers has been carefully traced by the abbé, and the spot carefully marked where disaster overwhelmed the pursuers. The good abbé seemingly appeals only to the piety of the Christian world, and makes no reference to the possible finding of treasures, — possibly because he shrewdly suspects that the legend may be true, and that in that case total annihilation of everybody and everything was probably worked by the avenging Deity. At all events, this supposition can be pleaded in case the search, if ever begun, yields no fruit.

An English Oak Tree. — The Rev. B. Edwards states that there is in Newland, Gloucestershire, England, an oak tree which measures forty-seven and a half feet in girth. This, however, is not so large as the decaying Cowthorpe oak in Yorkshire, which in 1718 overshadowed half an acre of land, and had a girth of sixty feet. A branch which was torn off at that time yielded five tons of timber.

The Bridge at Dinard, France. — A remarkable feat in engineering was brought to a successful issue in the latter part of September, at Dinard, France. In carrying a railway across the river Rance, the novel plan was adopted of building the bridge on shore, and pushing it bodily across the stream. The bridge weighed 2,600,000 pounds; its height above the river was 100 feet, and the length of the main span 314 feet. Twelve windlasses were used in rolling the bridge into position. It was calculated that four or five days would suffice to put the bridge into position; but, owing to the breakage of some chains, it took two weeks.

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THE convention of the American Institute of Architects assembled on Wednesday, November 19 (not on the 18th, as we said last week), at the building of the Equitable Life Assurance Society in New York, continuing through that day and the next. We have, of course, not yet received any account of the actual proceedings. The arrangement of the days was to be substantially like that of last year, the formal sessions of the convention being held in the morning and evening of the first day, and the morning and afternoon of the second, while the afternoon of the first day was to be occupied with excursions in the city, and the evening of the second with a dinner at Pinard's. The "excursions" comprised a visit to the new buildings of Columbia College, to the Lenox Library, and to the Columbia School of Mines, where an address on the Tenement-House Question, with pictorial illustrations, was expected from Professor Chandler. A number of papers on interesting topics were promised: one on the Proper Distribution of Weights to secure Equal Pressure on Foundations in Soft Soils, by Mr. F. Bauman, C. E., of Chicago; an Account of the Architectural Course at the College of the City of New York, by Professor Russell Sturgis, F. A. I. A.; on the Proportion of Inlet and Outlet Shafts in Ventilation, by Mr. Lewis Leeds, of New York: these in the morning session of Wednesday. For the evening session of the same day, were promised a paper on Atelier Instruction in Europe, by Mr. Wm. Watson, Ph. D., of Boston; one on the Influence of Size and Shape of City Lots on every Part of Houses built thereon, with illustrations of American and Italian stairways, by Mr. E. T. Potter, architect, of Newport; on Domestic Architecture as illustrated by the Early Dutch Settlers in New Jersey, by Mr. J. C. Cady, F. A. I. A, of New York; and on the Decorative Quality of Early Italian Painters, by Professor Charles Eliot Norton, of Harvard University. The papers for the Thursday session were, in the morning, on Some Suggestions for the Improved Construction of Building Acts, by Mr. Alfred Stone, F. A. I. A., of Providence; on Some Causes of Failures in American Architectural Designs, by Mr. W. A. Potter, F. A. I. A., of New York; on Interesting Devices of Fire-Proof Houses in Paris, by Mr. Watson, with illustrations; and on the Typical Sanitary House, by Mr. T. M. Clark, A. A. I. A., of Boston; in the afternoon, on Greek Antiquities, the result of a recent visit by Mr. Joseph T. Clarke, junior member of the Boston Chapter; and on Reminiscences of Viollet-le-Duc, by Mr. Edward Raht, architect, of New York.

THE first number of the promised *American Art Review*, for which many people have been looking with interested curiosity since its announcement a few months ago, has been issued by Messrs. Estes & Lauriat, in Boston, New York, and Chicago. It is a handsome monthly, with a page somewhat smaller than the *Portfolio*, of about the size and shape of the *Art Journal*, we should say, without having a copy of that before us. It is liberally illustrated with full-page etchings, wood-cuts, tail-pieces, and initials, and gives forty-eight pages of letter-press, the general make-up and aspect being as attractive as those of its European fellows, and its price the same as that of the *Portfolio*, — a dollar a number. The managing editor is Mr. S. R Koehler, of Boston; the associate editors, Messrs. William C. Prime, of New York, and Charles C. Perkins, of Boston. It prints an imposing list of contributors, among whom we see the names of most of the men who are known as writers upon art in the United States, and some Europeans. The strong feature in its illustrations is intended to be its etchings, of which three are promised with each number, it being the only American journal which has thus far been so illustrated; as it is the only one projected on an equal scale with the great European artistic periodicals, *L'Art*, the *Gazette des Beaux-Arts*, the *Portfolio*, and the *Zeitschrift für Bildende Künst*. The editors reasonably hope that their *Review* will be a means of healthy development to the practice of etching among American artists, and have announced a series of plates from those of them who practise the art, among whom they mention Messrs. Foxcroft Cole, Bellows, Swain Gifford, Smillie, Church, the Morans, Samuel Colman, J. W. Champney, Chase, Inness, Vinton, and others. Besides these they promise works of various noted European etchers, among them Messrs. Unger, Flameng, Rajon, etc. The *Review* proposes to be entirely æsthetic in tone, opening its pages to writers of all schools, and to supply its readers with original articles in all the departments of the fine arts, with a chronicle of all that is most important in the contemporary practice of art, its history, and its archæology.

FOR etchings in this number we have first a plate by Mr. Swain Gifford, a clever bit of pure line etching, very agreeable in tone, a rough bank crowned with a dwarf stone pine on the left, skirted by a path which leads the eye pleasantly to a charming distance of sea and low shore on the right. The second plate is a rendering by Mr. Smillie of a painting by Jacque in Mr. Belmont's collection, called a Landscape with Sheep. It translates very cleverly the sombre luminousness and vigorous handling of Jacque's work. The darks of the trees, bitten in with great energy and reinforced by the manner of inking the plate, are a little blotchy in effect, but give a very forcible impression of Jacque's way of treating masses of heavy foliage. The third etching is one of Rajon's remarkable portrait etchings, from a comparatively unknown portrait of Murillo by himself, in the Hungarian gallery at Buda-Pesth, formerly the Esterhazy Gallery. The masterly modelling of the face, the rich tone, and quiet handling of the whole plate are what one expects from Rajon. The printing of the etchings is very knowing, and must have been done with great care, especially in the plate from Jacque. The wood blocks are less interesting, carefully cut, but sometimes suggesting an effort to make up in blackness something that they lack in animation of drawing. The letter-press is of varied quality and interest. Many students of art must have wished to have the material of Overbeck's *Antike Schriftsquellen* made more accessible than it is in its native form, and here we have the first instalment of it, the citations translated and accompanied by a scholarly commentary by Mr. Perkins. Mr. Van Brunt contributes an excellent illustrated article on the Washington Monument, the first of two. A slip of the pen leaves us in doubt, by the way, whether it is Klenze's Ruhmeshalle or Schwanthaler's Bavaria that Mr. Van Brunt means to praise among modern monuments. There is an introduction, giving a popular description of etching, and notices of the etched plates, by the managing editor. Mr. Davidson gives an account of the new statue called of Hermes and ascribed to Praxiteles, lately discovered at Olympia, of which there is a cast in the Boston Museum of Fine Arts. There is a paper on the Barye bronzes in the Corcoran collection at Washington, by Mr. Macleod, the curator, and slighter articles on The Material of American Landscape and Impressionism in France, with several book notices, more than ordinarily good, and an Art Chronicle. The promise of the new magazine seems to us excellent. The only difficulties that we see foreshadowed are those that attend the effort to preserve entire neutrality among schools and tastes and doctrines; and the need which every artistic publication in this country — and most elsewhere — seems to feel of appealing at once to a professional and a popular constituency.

ABOUT one half of the thirty-sixth annual report of the New York Association for Improving the Condition of the Poor, which

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we have received, is taken up with the consideration of the tenement-house problem, and contains matter that is of much interest to persons who have followed the recent movement in New York for improving the housing of the poorest classes. It gives a succinct account of the agitation of the subject during the past year; of public and private meetings, the revision of the Tenement-House Act, the *Plumber and Sanitary Engineer's* tenement-house competition, the formation of associations for building improved houses, and the general inspection of tenement-houses that has been carried on. It shows, especially in this last respect, how much labor is undertaken by those who are really doing the work for which the public meetings held last winter furnished the inspiration. It cites gratifying results from the practical experiments carried on by Mrs. N. Miles, of New York, in emulation of those of Miss Hill, of London, of taking in hand, that is, some of the worst of the existing tenement-houses, overhauling and repairing them and reforming their management so as to make them clean, orderly, and wholesome; experiments which show by the example of the Mulberry Street building that the thing can be done with pecuniary profit if it is done in the right way. The report contains some striking accounts of the result of tenement-house inspection by Mr. George C. Booth, and is illustrated by one or two plates, including a plan of a building in Paris used for work-shops and lodgings, and a rough view of the Peabody Model Dwellings in London. It sets forth pretty clearly, by both inference and statement, the difficulties that lie in the way of improvement and that will prevent the movement that is now on foot from effecting radical improvement unless it is followed up, more than popular movements are apt to be, by laborious and long-persistent effort. The greatest obstacles are naturally the inertia of the class that it is intended to benefit and the active opposition of owners, both of which are obstacles of a kind that is apt to be more long-lived than the enthusiasm of popular or philanthropic effort. There is no small difficulty, as the report intimates, in the necessary process of enforcing upon the very poor the doctrine that cleanliness and orderly living are at once essential to health and comfort, and practicable, since they look for enjoyment to different sources, and obstinately persist in maintaining an appearance of robustness under conditions which seem to persons of better habits no less than poisonous; so that, as the report says, "it is indeed a marvel that so many persons actually thrive amid filth." That they would thrive far more away from it is clear enough to those who know, but to make it clear to themselves is not easy.

The details given by Mr. Booth in his report of inspections are amazing, as such details always are amazing, even to those who have heard something of the kind before. It seems incredible that human beings survive, imprisoned in the midst of the nastiness that he describes. One shudders to think of the horrible result if pestilence should get a foothold in such places as he visited under the names of "Murderers' Row" or "Bulldog Alley," and one wonders that a plague does not germinate there. The ultimatum of crowding seems to have been reached in one case which he records; here he found a woman living with her husband and three children, and expecting a fourth, in a low upper room eight feet by twelve; all sleeping on the floor and covered by one rug. The woman was lamenting that her *lodgers* had run away without paying their rent. On inquiry he learned that the family had shared their room with another family consisting of a man and wife and two children. These also slept on the floor wherever they could find room, "so that in this room, about 8 by 12 and 5½ [?] feet high, nine persons had slept and eaten." To arrange sleeping accommodations for so many in such a space would seem to be almost as much of a task as planning a house. A significant and discouraging indication of the obstacles to improvement which would remain, even if proper quarters were provided, is found in the account given of certain houses on Cherry and Rooseveldt Streets which have been cleansed and improved, and where, with room for a hundred and fifty families, there are only fifty, notwithstanding improved accommodation and diminished rent; "so that in this instance at least, in the opinion of the housekeeper, it does not pay to enforce law and order." Experience teaches, and the stories of this report confirm it, that however hopeful it may be to offer opportunities for improvement to the better poor, there always remains a class which abhors restraint and painstaking and decency, and which, if means of cleanliness are thrust in its way and room afforded for decency and comfort, will prefer to live in filthiness and will leave empty space around them to huddle into unclean contact. Here is the residual problem of the tenement-house question.

The formidable character of the opposition of the owners is indicated by the figures. "The health authorities," says the report, "justly claim that they have to contend against great opposition. The tenement-houses of the metropolis represent two hundred million dollars' worth of property; their owners are organized, and are able and willing to spend money to oppose any reforms which touch their pockets. They have their representatives in the legislature, and they stubbornly resist improvement." It is not only in their pockets that they are touched; for besides the natural objection of any American to being interfered with in his private business, however noxious it may be, he need not be very thin-skinned to be spurred into opposition by a reform, however justifiable, which publicly brands him and his class as rapacious brutes. But if the estimate of the report is to be accepted, the pecuniary argument of the landlord is more cogent than we had supposed it to be. It is assumed that the income from this two hundred millions of tenement-house property is at least ten millions. We had supposed that such property was far more profitable. Even if it is true, as the report avers, that a small percentage on this sum would make the houses "truly sanitary," we can hardly wonder that hard-fisted landlords are unwilling to expend even a small percentage for the benefit of tenants who pay them only five per cent, unless they can be persuaded that the outlay will bring them an increase of rent; nor can we wonder if, looking at the matter with the eyes of unscrupulous monsters, they think it more profitable to employ a portion of this income in opposing adverse legislation than in what they may choose to regard as idle philanthropy; we should fear that, upon this computation, the work of reform was an up-hill undertaking. We can hardly think, however, that the margin is so small, in face of the universally accepted belief that tenement-house property is one of the most paying investments, or of the rates of rents that are everywhere published.

It is not often, fortunately, that a period of time passes which is marked by so many deplorable and distressing accidents in the several fields in which man exercises his constructive talents as have occurred during the past two or three weeks. Not one of these mishaps is unmarked by incidents of very unusual character; not one that has not a trace of romance amidst all its horror; not one that does not bear its warning for the future; nor yet one in which human culpability cannot be clearly traced. Passing by the singular succession of marine disasters, and the fall of the St. Charles Bridge, over the Missouri River, as being outside the limits of our proper province, neglecting also the fatal explosion of starch dust in the candy factory at Kansas City, Mo., the bursting of a warehouse filled with flaxseed in bulk, at Buffalo, and the fall of an onion-laden floor at another place, we come to two disasters in New York which, in spite of their being so common as to be almost vulgar, cannot be contemplated without feelings of indignant pity. The full accounts contained in the daily papers relieve us from the necessity of detailing the events of the burning of the tenement-house in Cannon Street, on November 14. This building was occupied by twelve families, and although it was not wholly burned, yet six persons lost their lives, because there was, as far as we can learn, but one staircase, which was filled with flame and smoke, no fire-escape in front, and no means of exit on to the roof. The fire which occurred, with fatal effect also, in the building of the *Churchman* on the same day suggests the thought that legislators would do well to turn their attention to the way in which are conducted in the midst of crowded cities manufactures of substances which are dangerous to the public welfare in either their manufactured state or during the process of manufacture. The fire in the *Churchman's* building started in the room occupied by the Celluloid Shoe Protector Company, whose stock, composed of one of the most dangerous materials of modern invention, spread the flames with frightful rapidity. We hope that the time is not far off when certain manufactures will be relegated to the outskirts of a city, with as unyielding severity as is now meted out to the manufacture of gunpowder and the grosser explosives. The hardships that would at first be inflicted on the manufacturers of and dealers in hydro-carbons, oils, explosives, celluloid, chemicals, and any of those articles in whose manufacture explosive dust is generated, would be much miti-

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gated by the use that could be made of the telephone, most universally useful of modern inventions, and by the facts that ground rent would be cheaper and operatives could find cheaper and healthier lodgings.

ANY one who turns over the pages of our journal from its first number up to the present one can hardly fail to perceive that American draughtsmen as a body are far from being a skilful or an artistic class; but as an inspection of the illustrations of the early numbers of the English building journals would probably show that in the early days of those journals English draughtsmen were, considering their more advantageous surroundings, quite as backward as our own, it is proper to entertain the hope that the *American Architect* may play as important a part in instructing the eye, hand, and taste of American draughtsmen as its English prototypes have played in England. It would be interesting to enquire what part the illustrated building journal has played, not only in cultivating the powers of the modern draughtsman, but even in forcing him to exert himself to maintain his position as a member of an artistic fraternity. Coming into existence about the time that the photographic camera was beginning to promise to relieve the architect from the necessity of preparing with his own hand the most valuable portion, perhaps, of his working library, it has doubtless preserved and fostered, in the rising generation, the artistic feeling and the manual dexterity which have been the marked characteristic of so many architects of the preceding generations. Having few of the extraneous advantages which surround his English and continental compeers, the American must trust chiefly to books for his instruction, and as these are too costly for most persons to acquire in any considerable numbers, and as public libraries are obliged in self-defence to enforce rigid regulations as to the use of any books they may own, any enterprise that undertakes to put more or less directly into the hands of draughtsmen a good working library should receive all encouragement from the members of the profession.

SUCH an enterprise is that of Mr. George F. Hammond, a young architect of Boston, who is endeavoring to bring into being the Boston Draughtsmen's Association, the chief aim of which is to be, as set forth in the circular we have received, to establish a reading-room, where are to be found all the best English, French, German, and American technical journals on art, architecture, and engineering. These are to be placed at the disposal of the members for the most practical uses, subject only to such rules as shall prevent their total destruction; so that a draughtsman may have the opportunity to fill his scrap-book with tracings from designs ordinarily inaccessible, since the laws of the public libraries now prevent his making them from their books. It is also proposed to have classes in charcoal drawing, and in drawing from the life. Competitions with prizes of small value are to be held from time to time, and we dare say that other features will be introduced in the scheme of the association as time shows its needs and develops its resources, and if its managers take the pains to interest in its success some of the older members of the profession, it cannot but be that there will be a conscious gain of dignity and earnestness infused into its proceedings which may lead to the most satisfactory results. The scheme of the association is sufficiently broad to insure an ample membership, consequently a low annual assessment, three dollars, and a full list of periodicals. Although the enterprise was undertaken by an architect, yet those who have given their adhesion to the scheme number among them, besides architectural draughtsmen, engineers, engravers, draughtsmen in lithographic establishments, in jewellers' shops, photographic artists, pupils of the evening drawing schools, and members of various other classes of society.

HYGIENE AND PUBLIC HEALTH.[1] III.

IN the last two papers of the first volume is contained what we do not hesitate to call the best short treatise on ventilation within our knowledge. Not only are the facts related in regard to certain natural climates of great interest in the discussion of artificial heating and aeration, but the descriptions and criticisms of appliances in actual use are extremely judicious. The subject has been so much treated by writers with pet hobbies, or patentees interested in throwing an air of mystery about it, that architects who have little knowledge of ventilation dread to undertake work of the kind for fear of being led astray, as many of them are; while those who have made up their minds from actual experiments are in hardly less danger of being driven from their ground by the pressure of conflicting theories. The impartial references to existing buildings, which they can compare with their own experience, will be to them of peculiar value.

After a clear account of the composition of air, the author devotes some pages to evidence regarding the vexed question of the effects of carbonic acid in the air. We have heard so often that it is a neutral element, acting simply "by diluting the oxygen," as one writer asserts, and again that it is deleterious, and must be got rid of wherever found, that it is a satisfaction to be told, on good authority, that "we must not conclude that because the quantity of carbonic acid is small the effect is small. The conclusion is rather that minute changes in the amount of this acid are indications of occurrences of the highest importance." Of course, the occurrence which is chiefly indicated by an excess of carbonic acid is organic contamination of the air; but in some experiments quoted, where pure carbonic acid was introduced into pure air, two per cent was proved to give a mixture dangerous to life, although the experimenters asserted this atmosphere, in which candles were instantly extinguished, to be "by no means so unpleasant as a school-room."

Before describing the phenomena caused by organic contamination in the air, the author devotes some pages to inorganic impurities, and gives an interesting description of the office of oxygen in respiration.

Briefly, the oxygen passes through the thin walls of the lung-cells into the blood, where it enters into a loose chemical combination with the matter of the red corpuscles, and, being carried in this way into the muscles and tissues, is given off again in exchange for carbonic acid. Carbonic acid, when present in excess, merely remains in solution in the blood, ready to pass off as soon as pure air is supplied. Carbonic oxide, on the contrary, "combines with the matter of the blood corpuscles with such eagerness as almost to prevent the oxygen from entering into combination when inhaled, even after the poison has been removed from the air." Hence its deadly effect, which is said to be the same as that caused by the total deprivation of oxygen in drowning, and the relief, if any is possible, must be effected in the same way, — by keeping up artificial respiration until the poison is slowly eliminated.

Carbonic oxide is asserted to be often present in the atmosphere, and, as might be supposed, sometimes with fatal effects. Most people know the characteristic smell, and the blue flame, which show its existence around an anthracite fire freshly kindled, or burning with insufficient air, and can often recognize it in rooms heated by hot-air furnaces, so that a warning against its dangerous character will be of use. A possible future source of trouble is found in the so-called water-gas, which, as Dr. Lincoln says, "is produced by passing steam over incandescent carbon, which has a very powerful attraction for oxygen, abstracts it from the steam and unites with it to form, at first, a mixture of hydrogen and carbonic acid; the latter afterwards loses one half of its oxygen and becomes carbonic oxide. These gases burn without light, and require the addition of about ten per cent of petroleum or naphtha gas. This mixture contains from thirty to forty per cent of carbonic oxide, and would be *excessively dangerous to life*, if it were inodorous, as in some instances it is." This water-gas is now supplied in large quantities in many parts of the country for heating or illumination, and no one who is concerned with matters affecting the sanitation of buildings should neglect to inform himself of its qualities.

Of the effects of organic impurity, a striking illustration is quoted, much more to the purpose of ordinary life than the horrible details of the Calcutta Black Hole, or the steamer Londonderry, as follows, relating to an experiment tried in the London Zoölogical Gardens: "A new house was built to receive the monkeys, and no expense was spared which, in the opinion of those intrusted with its management, could insure to those natives of a warm climate all attainable comfort and security. Unhappily, however, it was believed that the object would be best secured by making the new room nearly like what an English gentleman's drawing-room is. For warming it, two ordinary drawing-room grates were put in, as close to the floor as possible, and with low chimney openings, that the heated air in the room should not escape by the chimney, while the windows and other openings in the walls above were made as close as possible. Some additional warm air was admitted through openings in the floor from around hot-water pipes placed beneath it. For ventilation in cold weather, openings were made in the skirting of the room, close to the floor, with the erroneous idea that the carbonic acid produced in the respiration of the animals, being heavier than the other air in the room, would separate from this, and escape."

Such a room, supplied wi h warm air by indirect radiation from hot-water pipes, and ventilated by two open fireplaces, would, independent of any other openings, still be generally looked upon as the *ne plus ultra* of healthful and comfortable arrangement. Few drawing rooms, and still fewer school-rooms, have anything to be compared with it; but its effect upon the inmates showed that something was still lacking. "When all this was done, about sixty healthy monkeys, many of which had already borne several winters in England, were put into the room. *A month afterward more than fifty of them were dead, and the few remaining ones were dying. The cause of this mortality was consumption.*"

Nothing is more common in the better class of houses than to

[1] *A Treatise on Hygiene and Public Health.* Edited by Albert H. Buck, M. D. Vols. I. and II. New York: William Wood & Co. 1879.

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find rooms heated by furnace or steam, in which one cannot sit with other persons for an hour in the evening without noticing the cold feet, hot head, sleepiness, or irritability which indicate the effects of foul air, but which the architect or owner points out with pride as an example of perfect ventilation, because they have open fireplaces in them, even though a fire may never be lighted.

An illustration of the extremely slight contamination which is sufficient to produce bad results is given in the well-known property which city air has in hot weather, of causing or predisposing to bowel troubles in young children, while country air at the same temperature shows no such quality, although to analysis there may be no difference in the constitution of the two atmospheres. To some similar inappreciable differences in constitution are probably due the variations of climate as to effect upon health. Perhaps the most refreshing and delicious air to be found in the world is that of the Alpine slopes, neither in the valleys nor at the top of the mountians, but half way up the ascent; and yet the analysis of air taken at the rocks called the Grands Mulets, half way up Mont Blanc, showed it to contain less oxygen and more carbonic acid than the average air inside a *theatre* in the middle of the performance, while the average of five analyses from the Faulhorn gave a proportion of oxygen very slightly greater than that of an ordinary stable on first opening it in the morning, and considerably less than that found in "a very small room in which a petroleum lamp had been burning for six hours." Even more difficult to explain is the circumstance that the mountain air, under an extremely low barometic pressure, should have the stimulating quality which on the lowlands is always associated with a high barometer. The clouds and rain which generally accompany a low atmospheric pressure may account for a part of the depression of spirits caused by it on ordinary levels, but even in sunshine the condition of low barometer which precedes thunder-storms, so far from giving any resemblance to mountain air, generally indicates one of the most trying states of the atmosphere which we have to bear.

Equally obscure is the effect of climate on diseases of the lungs. According to the tables, the liability to consumption shows a diminution in ascending from the coast to the highlands, and at a certain altitude, varying in different latitudes, the disease vanishes. In the upper Engadine, and in the valley of Davos in the Grisons, phthisis is unknown among the natives, and the indications are that their dry atmosphere with low barometer assists materially in giving immunity from the disease to those brought up in them; while, on the contrary, of the recorded effect upon consumptive patients of various climates by far the best results were obtained from long sea-voyages, where the conditions as to dryness, low pressure, and temperature are completely reversed. It is reported that consumptive soldiers sent to the Himalaya Mountains showed a rapid increase in the dimensions of the chest, and it is a common observation that mountaineers develop great chest capacity, as if to compensate for the rarity of the air at great elevations. Perhaps this increased volume of the lungs confers a power of aerating the blood by means of air containing a small proportion of oxygen, which may greatly strengthen the subject against adverse influences, while the healing quality of pure air may be felt more quickly where it is presented in the greatest density, and with the maximum proportion of ozone and oxygen, as at sea, although the stimulus which excites the lungs to increased action and growth, by the insufficiency of oxygen which their ordinary inspiration of a lighter air would give, may be wanting.

But one thing is certain, that the essential element in the good effect of any climate is the opportunity of breathing an unlimited amount of fresh out-door air, whatever its quality, and we may confidently assume that whenever our buildings shall be so arranged as to insure a current of outer air through them, night and day, to the extent of not less than three thousand cubic feet per hour to each person, and our habits of life shall have increased our average breathing capacity, and accustomed us to out-door exercise to as great an extent as that habitual to the mountaineers, we shall not need to envy them their exemption from pulmonary diseases.

How far from attaining this desirable state of affairs we now are, is shown by the statistics. School-rooms, which should, in consideration of the susceptible organism, the quick respiration and undeveloped physique of children, be the best ventilated of all our rooms, are found to be by far the worst, so that they form in the reports a kind of standard of the worst endurable contamination. While the proportion of carbonic acid which, when derived from respiration, forms a measure of the organic contamination reaches in the galleries of theatres from two to four times the normal proportion; in school-rooms it is found in from four to thirty times the standard amount. The best schools noted, those of Boston and Philadelphia, have an atmosphere agreeing to within a small fraction with that of the underground railway tunnels in London, and the Michigan high schools, which stand next highest on the list, enjoy an air which averages slightly worse than that of ordinary railway cars, and far worse than the worst theatres. Beyond this there are no further means of comparison. The school-rooms enjoy undisputed preëminence over all other foul places, differing only in degree among themselves, up to the worst, which was more than five times worse than the average smoking-car. And in such places, it must be remembered, the young are condemned to remain, not occasionally from ten to thirty minutes, but for five or six hours every day, until their native power of resistance to the evil influence is exhausted.

This is a state of affairs which cannot be passed over lightly, or laughed away with accounts of the imitation registers frescoed on the walls, which have been known to do duty for ventilators in such places. Some thorough reform will soon be demanded. None know better than architects how limited are not only the means, but the knowledge, which they have at hand for supplying the demand, and they are glad to come to the physicians and learn from them the results of their practical experiments in hospitals, experiments which the architects themselves are rarely allowed to make at their client's expense, and have seldom the means for making at their own. The doctors have been rewarded with very great success. The ventilation of their buildings, as a rule, far surpasses that of the more ambitious structures erected for other purposes, even where good ventilation has been particularly sought for. They are to be congratulated upon this result of their science and perseverance, and if the architects could not have led the way, they, too, are to be congratulated on having such able leaders to follow. So we will put aside the temptation to regret that an architect's name had not appeared at the head of the little treatise on ventilating appliances which forms the last part of Dr. Lincoln's paper, and address ourselves to learning what we can from it.

One very sensible suggestion, which is not new, but is little acted upon, except in hospitals, is that "no room of ordinary size, or even a hospital ward" (and, let us add, school-room), "is the gainer by being made more than thirteen feet high. Indeed, the existence of abundant space may tempt us to neglect the necessity of abundant *renewal*, and so a large room be more unsafe than a small one. The only advantage of great space lies in the fact that we can *ventilate freely without giving rise to perceptible draught*." To this we might add that the carrying of all windows to within a few inches of the ceiling, the nearer the better, is of very great assistance in clearing the room wholly of the contaminated air which is apt otherwise to collect and remain under the ceiling.

The means for inducing a current are compared, and interesting examples collected, which seems to indicate that in difficult cases the air will need to be both pulled forward and pushed from behind, by an aspiration fan or chimney, combined with some mechanical means for introducing fresh air. This, we think, will accord with the experience of most architects. Every one does not realize that under the vacuum system alone, in which the source of motion is heat, a seven-foot gas burner, constantly lighted in a 12 by 12 flue of the height of an ordinary house-chimney, and supplemented by another flue of equivalent size for supplying fresh air, will change the atmosphere in an ordinary room only fast enough to supply three persons with such air as hospital patients and state prison convicts breathe.

With our ordinary 8 by 8 fireplace flues, the extraction of foul air, even with a fire lighted, would be not more than half of this. Without a fire it would be almost nothing.

Dr. Lincoln's opinion on this point is, that "the openings and ducts in ordinary buildings are almost invariably too small. Frequently they lead to no outlet. In some cases sufficient channels exist; but, from motives of economy, no heat has been supplied to warm them. The air supplied may enter at a point just under the point of exit, so as to compel the closing of the latter in order to retain the warmth. The air may be derived wholly from a furnace which possesses no arrangement for mingling cold with warm air. In this case, when the register delivers too warm air the only recourse is to close it, and thus lose a good part of the supply of fresh air. In short, common-sense is violated in all ways." There are few houses or school-rooms which do not illustrate this description.

The author gives many useful illustrations of various systems of ventilation, besides some, hardly less useful, of heating apparatus, upon which he makes remarks which are very sensible and useful. The practice, common in houses and apartments, as well as office buildings, of placing direct steam radiators in the rooms, without provision for the entrance of fresh air, the author considers "extremely objectionable," and he suggests the imperviousness of the painted walls and the tightness of the joinery in the "family hotels," as an additional cause of the discomfort felt in them. Another suggestion, which is familiar to architects, but which they find it difficult to enforce upon furnace-men and owners, is that no introduction of fresh air can take place without an outlet for the escape of foul air, and it is not safe to take it for granted that any so-called ventilating flues are in working order, except the chimney and open fireplace. In general, he thinks that no room is fit for habitation without a chimney.

More matter upon this subject is to be found in the papers on Hospital Construction and School Hygiene, contained in other parts of the work; but we must refer our readers to the original, for further information, promising them that they will be amply repaid.

Some slight errors of proof-reading appear in a few of the papers. One of them always presents "matrass" instead of mattress, — a rather comic mistake. Names of localities are misspelled, as Dombes for Doubs, Tescudo for Tezcuco; but these hardly detract from the general excellence of the matter. The index might be much fuller with advantage, and we trust will be made so in future editions, which we hope to see.

The Town Hall at Farbach. — A fire at Farbach, Prussia, between Trier and Coblentz, has just destroyed sixty houses, among them the town-hall, dating from the sixteenth century.

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OLD SETON-HOUSE.

FRONT ENTRANCE

WASHINGTON D.C.

Scale

Plan of Jamb.

Details

Elevation of Architrave

Section

One Half Inside

One Half Outside

Base Board

Mouldings

Panel

Perspective View 1811

Architectural Illustration

THE HELIOTYPE PRINTING CO. 620 DEVONSHIRE ST. BOSTON

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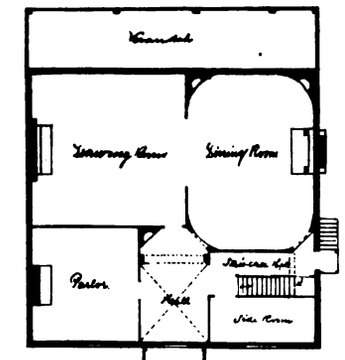
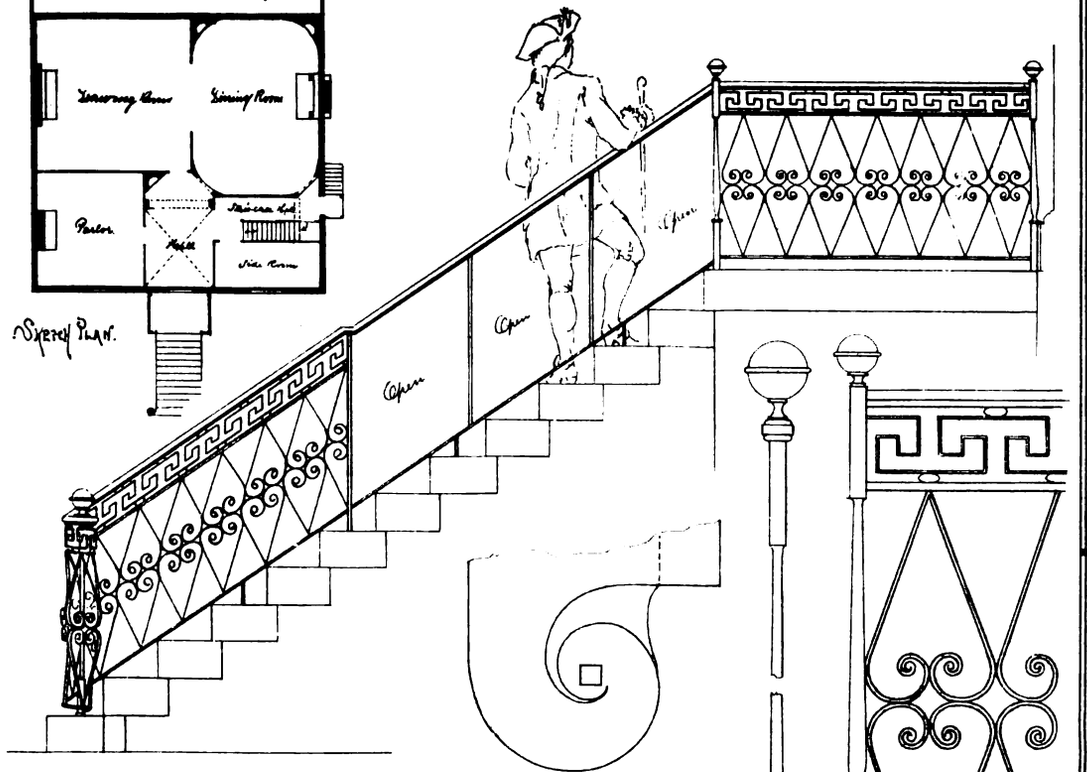
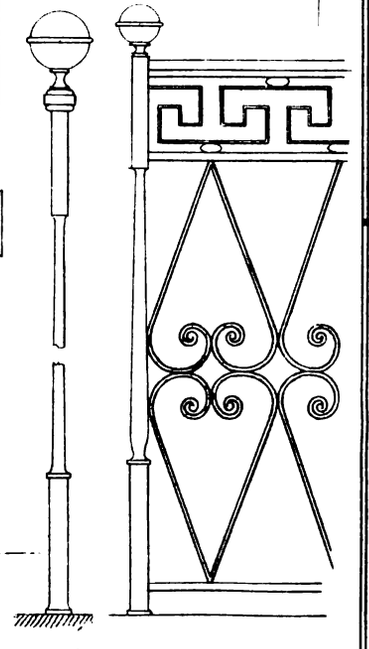
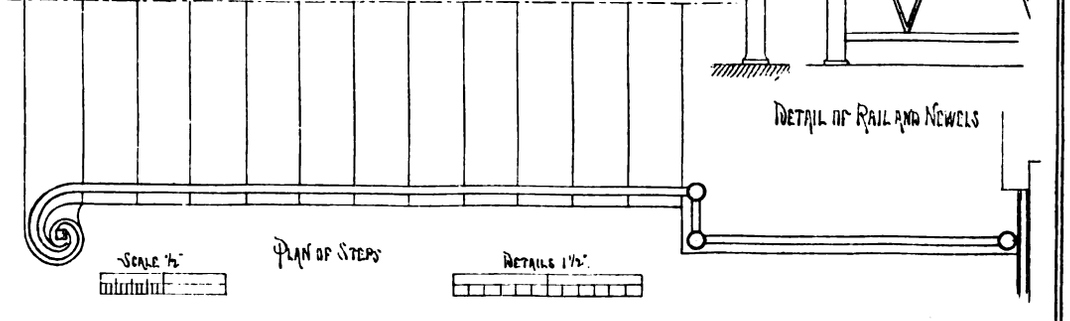
AMERICAN ARCHITECT AND BUILDING NEWS NOV. 22, 1879.

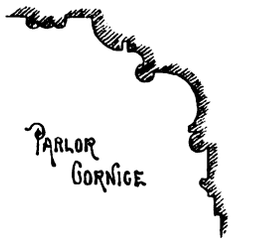
No. 204

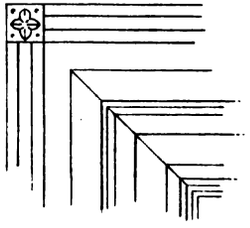


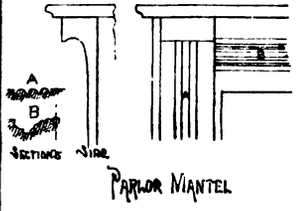


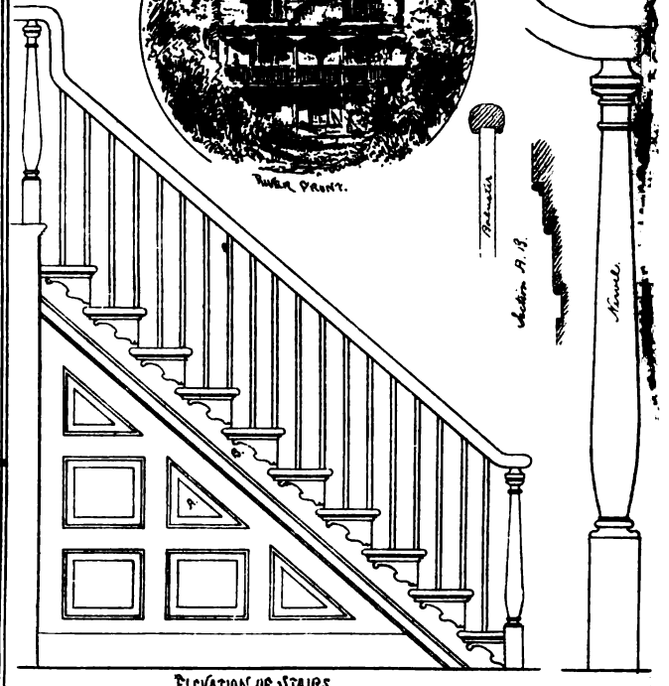


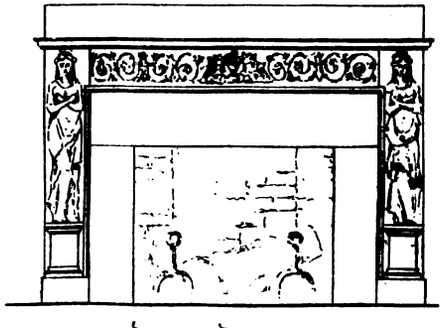


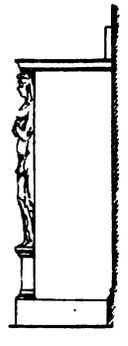












SECTION

DETAIL SKETCHES.

HOUSE

WASHINGTON D.C.

Geo. F. Foltman

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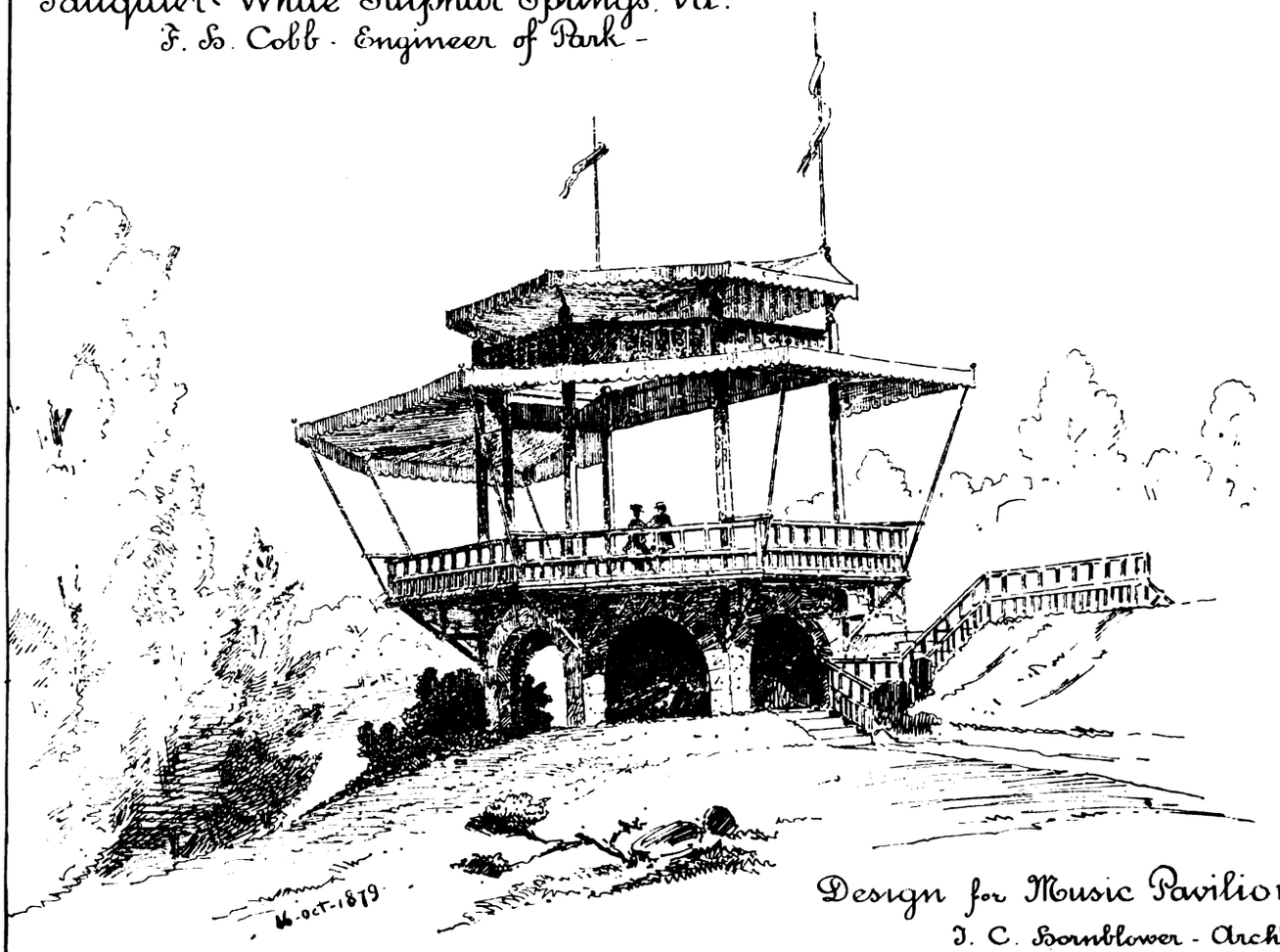
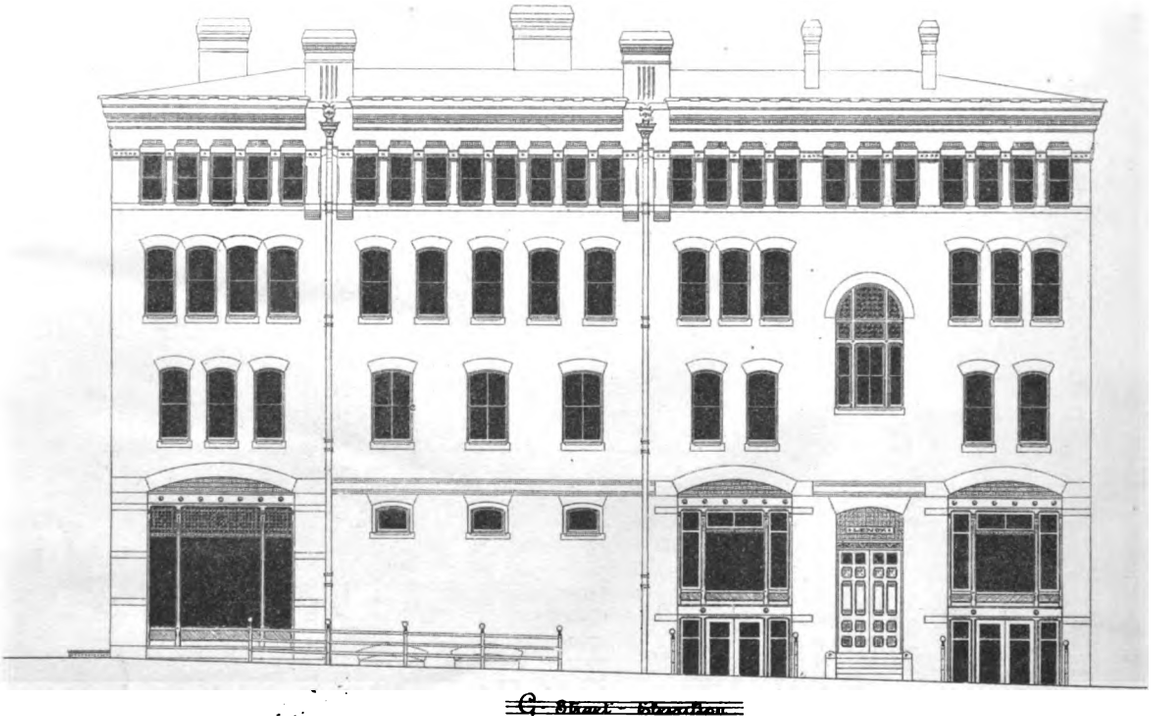
Fauquier White Sulphur Springs Va.
F. S. Cobb - Engineer of Park -



Design for Music Pavilion
J. C. Sornblower - Arch't



~~Senate Building - Washington D C~~
~~Designed for Gen Mc Vinnum, Ass't Sup't under~~
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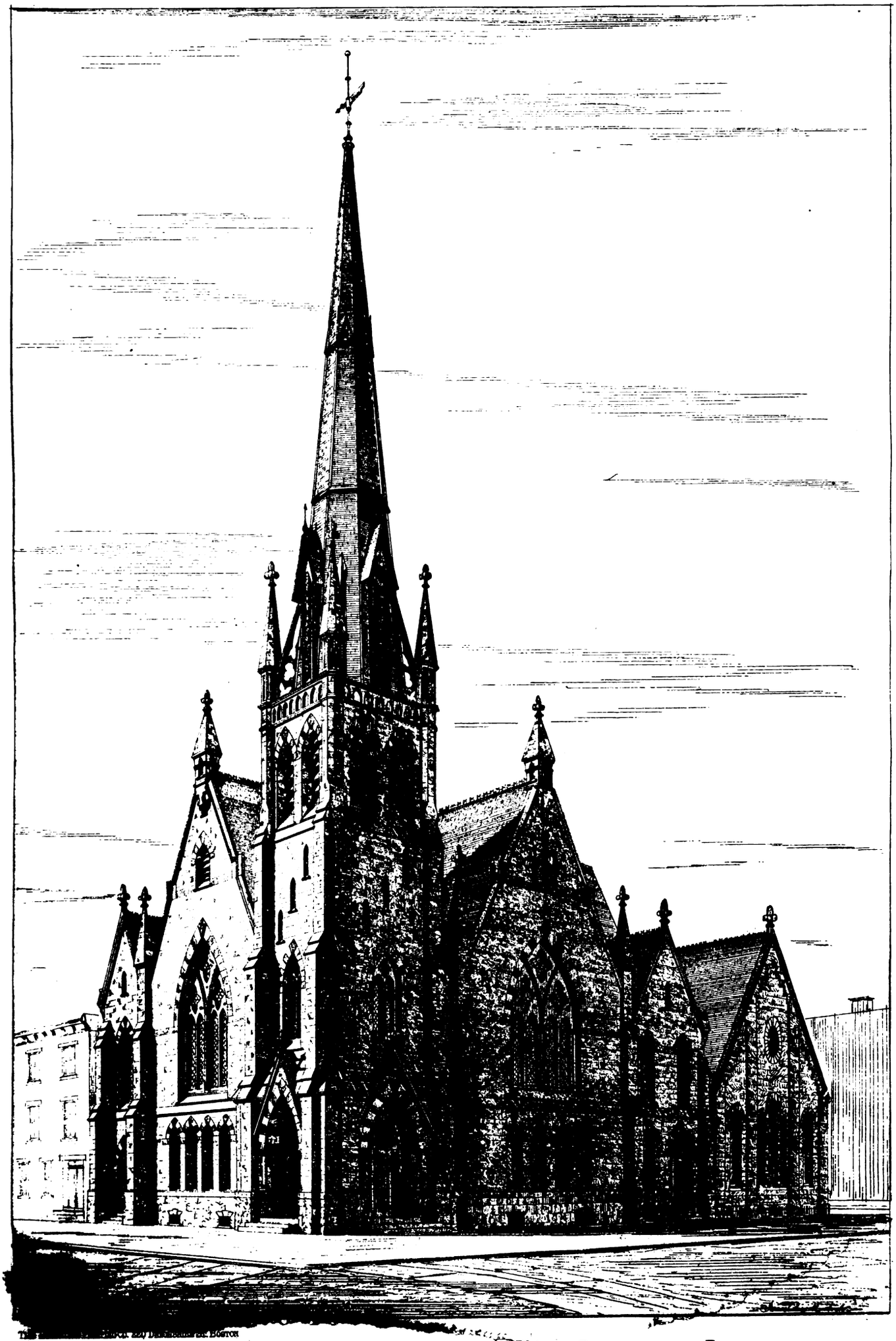

MORAVIAN CHURCH OF THE HOLY TRINITY PHILADELPHIA PA.
I. PURSELL. ARCH'T.

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OLD SETON-HOUSE.

FRONT ENTRANCE.

WASHINGTON D.C.

Scott Truman Del.

PERSPECTIVE VIEW.

ELEVATION OF ARCHITRAVE

DETAILS

PLAN OF JAMB

SECTION

ONE HALF INSIDE

ONE HALF OUTSIDE

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THE INTER-OCEANIC CANAL.

THERE is an almost irreconcilable difference of opinion among American engineers about the best route across the Isthmus. Some of them desire that a crossing be made at Nicaragua, where, though it will take four and a half days for a ship to go through the canal, the capital required for the undertaking will be no more than $86,000,000. Another party of engineers favor a canal across the Isthmus of Darien, where the expense will again be comparatively small, probably not over $100,000,000 at the furthest, the canal proper being about thirty-one and a quarter miles long, and having two locks. A third and numerous party of engineers prefer the magnificent San Blas route, the shortest of all, in a region free from floods, where the ground is hard, and where a canal can be constructed on the sea level, without locks, for $95,000,000. This is the tunnel route, on which the mountains will have to be bored for eight and a quarter miles. The advocates of these several plans are enthusiastic and persistent in regard to them; and it is not easy to see how a decision is ever to be made between them, even should a new Congress be convened to consider the matter.

One thing, indeed, appears to be certain. The projects of the Americans were not adequately treated at Paris, and the Congress assuredly voted somewhat in the dark. This appears beyond question from the printed volume of the proceedings of the Congress, which the *Tribune* has just received from M. Henri Bionne, the Secretary General of the Congress. Valuable as was the work performed by that gathering of eminent philanthropists and geographers, in putting on record the ripe opinions of experienced engineers concerning the inter-oceanic canal and its advantages to the world at large, an examination of the volume of proceedings of the Congress inspires some regret as well as much admiration for what was done. Few of the delegates had, previous to the meeting, any adequate idea of the colossal nature of the question with which they were to be called upon to grapple. They came together expecting to adjourn in eight days. When they confronted the problems presented by the canal, the eight days stretched out to two weeks. Even then all the proceedings became so hurried that the presiding officers were compelled to refuse a hearing to the plans of a large number of American engineers. The Congress itself sped on to a vote on merely a partial presentation of the facts. Nor was that all. When the Committee on Routes reported to the Congress, the cost of all the purely American routes was estimated at double the figures fixed by their respective authors. The cost of the San Blas Canal was raised to $240,000,000; that of the Nicaragua project to $230,000,000; and the Atrato-Napipi route to $200,000,000. This was an inexplicable proceeding, unless it be admitted that the Americans are all wrong about the canal. The figures were raised against the protest of the delegates from the United States, and no reason was given as to why they were so raised, except that the committee regarded the estimates as too low. The Panama Canal was estimated at about $220,000,000 by the committee; and it was upon this showing of comparative cost that the whole Congress, in general session assembled, voted. There appears to be some foundation, therefore, for the unanimous assertion of the delegates from this country, and of engineers in general at home, that the decision of the Paris Congress was not based upon an accurate knowledge of the facts. Their position is justified by the record.

Even if the Congress acted hastily, however, it does not yet appear that its decisions are likely to have much weight with M. de Lesseps, or that he is likely to begin an inter-oceanic canal without a complete knowledge of all the facts. He has, indeed, suspended the business of taking subscriptions for the capital stock of the canal company, until a new survey of the Isthmus of Panama of the most serious and thorough description can be made; and his engineers, under the lead of M. Blanchet, have been sent to Panama to make that survey. Until they report, and public confidence in the route is established, there is no probability that a pick will be struck into the ground or a dollar of capital be expended for the construction of a canal at Panama. — *N. Y. Tribune.*

THE ILLUSTRATIONS.

DETAILS FROM THE OLD SEATON HOUSE, WASHINGTON, D. C. SKETCHED BY MR. G. R. TOLMAN, ARCHITECT, WASHINGTON.

THIS house, numbered 708 in E Street, N. W., Washington city, better known as the old Seaton house, was built in 1821 by Wm. W. Seaton, Esq., one of the editors of the *National Intelligencer*, then the leading journal of the United States. For ten years Mr. Seaton was mayor of the city, a position at that time of singular prominence, and one severely taxing the social qualities and capacities of its incumbent, and this house was the rendezvous of the leaders of political society, as well as of the more exclusive higher circles of the capital. Here were constantly to be met the leading members of both political parties, and the beauty of all sections of the country. Webster, Clay, Calhoun, Hayne, and the other central figures of that marked period in our political history met at the lavish board of this generous host. At his door General Harrison mounted his horse to ride to take the inauguration oath of a President of the United States. The house is about square in plan, being 40 feet in width. When built it was the only residence in the block, and the view to what are now the Smithsonian grounds, several blocks to the south, and thence to the river, was unobstructed. Though now showing signs of age and decay, the building still evidences its former state. The grounds in which the house stands face north 60 feet upon E Street, and are 126 feet in depth. The building may be said to face backwards, the pantry and bath-room being at the front, and the drawing and dining rooms, two large communicating apartments, facing south, and opening upon a broad piazza the full length of the house. From this piazza was descent into the large and eminently Southern yard, about 60 by 80 feet.

A commodious hot-house stood at one side of Mr. Seaton's grounds, and in addition to this æsthetic occupant of the yard was a more prosaic, and at that time necessary, adjunct — a smoke-house, in which, long before Sam Ward's day, the regal mayor had a way of curing his own hams. In the growth of Washington the residence and grounds became gradually hemmed in; and when the late Board of Public Works of the District ran riot in its "comprehensive system of improvements," the grandeur of the place disappeared to give way to the present far from grand aspect of the spot. The building is still, however, as staunch as when first built, the fourteen-inch walls showing no signs of failing, and the old mantels and cornices, still remaining, attest, like the relics of Monticello, the designer's taste. The old mantel-piece in the drawing-room, of which a sketch is given, is of pure Parian marble, and is still intact. The house and grounds are a landmark, though at present devoted to the more modern purposes of a summer garden. But they promise shortly to succumb to the utilitarian demands of a day in which space is considered valuable in more than a horticultural sense, and an old house, no matter how sanctified by recollection, is deemed rather an eye-sore than a shrine.

MORAVIAN CHURCH OF THE HOLY TRINITY, PHILADELPHIA, PA. MR. ISAAC PURSELL, ARCHITECT.

This church is now being built at the corner of Twelfth and Oxford Streets. It is a two-story church, facing on both streets. The tower is on the corner and is 180 feet to the top of the spire. The first floor is divided into Sabbath-school, lecture, class, and library rooms. The second story contains the audience room. The pews are arranged in semicircles, and will seat comfortably 640 persons. The organ will be placed in a gallery over the pulpit. The walls are constructed with Trenton brown and Falls of Schuylkill gray stone. The contract price of the work is $18,700, excepting the pews, stained glass, and heaters.

THE LENOX BUILDING, WASHINGTON, D. C. MR. J. C. HORNBLOWER, ARCHITECT, WASHINGTON.

MUSIC PAVILION FOR FAUQUIER PARK, WHITE SULPHUR SPRINGS, VA. MR. J. C. HORNBLOWER, ARCHITECT, WASHINGTON, D. C.

THE TRADES-UNION CONGRESS AND FEMALE LABOR.

THE dislike which workingmen entertain to the idea of female labor was very plainly shown at the Congress. No subject can well be more embarrassing than this, because on none are the arguments on both sides so apparently conclusive. On the one hand the physical injury often done to women by prolonged hours of work, coupled with the fact that, left to themselves, women will usually work more than is good for them, points to the necessity for some legal restriction. The community suffers by the degradation of a whole class, and if women are allowed to work to excess, a large proportion of them will be liable to become degraded. On the other hand, a law which forbids women to work more than a certain number of hours a day is a law which says, "Be ye warmed and filled," without giving them the means of being either. These women have to live, and in almost every employment they can only live by making it the interest of masters to employ them in preference to, or, at all events, as willingly as men. If they are hampered by factory acts and the like, how can they possibly hope to do this? Men are free to work as long as they please, and even their self-imposed limitations in this direction are often merely a means of making a higher charge for overtime. Women are forbidden by law to work more than a fixed number of hours, and thus are prevented from commending themselves to employers who care more for the amount of work than for its quality. Undoubtedly, if society were organized on an ideal basis, the men would have the best of the argument. If every woman were maintained by her husband, or father, or brother, home would be all the better cared for, and children all the more healthily brought up. But the maintenance of every woman by her male relatives is as purely imaginary in modern society as the maintenance of every man by his proper rood of ground. As a matter of fact, women have very often to keep themselves, and not unfrequently to keep, or help to keep, their male relations. It hardly becomes workingmen, therefore, to speak as though the desire of women to work, and their impatience under laws which make it more difficult than it would otherwise be for them to find work, were a mere piece of feminine wilfulness. In the educated classes the desire to play their part in vocations hitherto confined to men may be an evidence of restlessness and vague discontent. But it is certainly not so among the poor. Their work is often the alternative, not to home, but to the workhouse. If women cannot earn their bread for themselves, they have often no means of getting it except from the relieving of-

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ficer. The speeches made on the question at the Trades-Union Congress left this aspect of the question completely out of sight. They contain no suggestion of a solution of the difficulty, no hint even that the difficulty had been recognized or appreciated. The strong class feeling which binds the members of trade-societies together seems not to extend beyond the male members of the class. Women are viewed simply as trade rivals, much as Chinese or coolies might be. If the Congress had been entirely made up of doctors it could not have been more determined to protect itself against female competition. — *Saturday Review.*

THE HYPÆTHRAL QUESTION.

Boston, October 29, 1879.

To the Editor of the American Architect:

Dear Sir, — Any regret I may have felt at the unintentional asperity in the tone of my criticism of Mr. Clarke's "Hypæthral Question" is entirely dispelled by his reply. For in it the same vagueness of statement, the same recklessness of assertion, and the same illogicality that characterized his pamphlet appear in increased measure. These are grave charges and ought not to be made without good grounds. Unfortunately these are not difficult to adduce. Before I proceed to take up Mr. Clarke's points *seriatim*, allow me, in order to obviate misconception, to say that I hold no theory on the "hypæthral question." I simply say that we have, thus far, no data sufficient to lead us to a definite conclusion in the matter, and that Mr. Clarke has not adduced in favor of his view a single unambiguous fact, or a single testimony from an ancient author.

1st. In reply to my assertion that Mr. Clarke had not been able to state the hypæthral question, he replies: "By hypæthral I understand, as is always understood in architectural usage, lighted from above, through a horizontal opening in roof and ceiling." This, indeed, may be admitted to be the ordinary English usage; but then Mr. Clarke has no right to appeal to Vitruvius as countenancing any such meaning, or to bring his testimony into connection with the question at all, for Vitruvius evidently means by "hypæthral," not "lighted from above, through a horizontal opening in roof and ceiling," but entirely open to the sky. This Mr. Clarke knows; for he says on page 7 of his pamphlet, that it "could hardly be applied to a mere orifice in the roof, as it means, literally, without any covering whatever." Thus it appears that the term "hypæthral," as used by Vitruvius in the famous passage which, according to Mr. Clarke, "is the hinge upon which the entire matter has turned," has a meaning altogether different from that accorded to it by English usage, and, therefore, that the passage has no bearing on the question. It is strange that Mr. Clarke, holding to the English meaning of "hypæthral," should yet speak of the temple at Bassæ as "an enclosed court."

2d. When Mr. Clarke, who tells us that he is "reasonably familiar with the literature of the subject," asserts that "only one writer has ever questioned the belief that this was the manner of lighting these buildings" (*i. e.*, by means of an "hypæthron"), he places himself in direct contradiction to Michaelis, who, in his great work on the Parthenon, page 24, note 69, says: "The existence of hypæthral temples, *recently often called in question*, especially by Ross, *Hellenika*, page 1, seq., in opposition to K. F. Hermann, has been placed by Bötticher beyond all doubt." I am not even "reasonably acquainted with the literature of the subject," and therefore I leave Mr. Clarke to settle this matter with Michaelis.

3d. My remark that "it is not true in any sense that the passage from Vitruvius, *in so far as it relates to the point at issue*, is obscure," Mr. Clarke first garbles, by omitting the limiting clause here italicized, then cites as obscure the very phrase which I had expressly admitted to be so, and taxes me with asserting *it* to be "explicit, clear, and unequivocal," whereas I distinctly confined these terms to the rest of the passage.

4th. Mr. Clarke next accuses me of altering the Latin text, in reading *est* for *et* in the obscure clause. I am not fortunate enough to be the author of that reading. It was adopted long ago by Vossius (ad Melam, page 73, edition of Burmann), and is stated by Schneider in the notes to his edition of Vitruvius to be "*virorum quorundam doctorum opinio.*" It is true that by so doing I make the sentence "refer alone to the temple of Olympian Zeus, at Athens," and this not without reason, as I will show. Vitruvius's first words referring to hypæthral temples are: "*Hypæthros vero decastylos est in pronao et postico.*" Now, as Mr. Clarke very well knows, there was but one decastyle temple in Athens, or even in Greece; consequently the words must refer to it, and it alone. But Vitruvius tells us that the example he cites was *octastylos*. He does not, however, say that it was *octastylos in pronao et postico*, as Mr. Clarke asserts, and, indeed, he could not, having already informed us that the hypæthros was "*decastylos in pronao et postico.*" I think I was justified, therefore, in looking for the eight columns elsewhere, and I modestly conjectured that they might have been in the interior at the two ends of the "hypæthros." Mr. Clarke declares dogmatically that this is impossible; but until he brings forward better evidences than his *ipse dixit*, I shall hold my judgment in suspension. When he says, "To consider an hypæthron [I was very careful to avoid "hypæthron" and say "hypæthros"] — that is to say, simply nothing — as being built into a permanent temple, thus leaving an opening in the roof of the structure, when this 'ran all the way around it,' is, indeed, a curious architectural conjecture," he forgets that a piece of real estate, even when not walled in or roofed over, is hardly "simply nothing." Elsewhere he himself cites τὰ ὕπαιθρα from Polybius as meaning "the open country." The open country is hardly "nothing." Moreover, I never said a word about "leaving an opening in the roof of the structure," — *nor does Vitruvius.*

5th. In defence of his assertion that Vitruvius "wrote more than four centuries after the decline of Greek architecture," Mr. Clarke now says: "Considering that the degeneration of the styles of Greek architecture, the gradual substitution of formalism for thought, began in the third quarter of the fifth century B. C., it may be said that Vitruvius, who wrote very near the advent of the Christian era, was about as far from Iktinos as we are from Jeanne d'Arc." He was about thus far from Iktinos, whether we consider the degeneration or not; but what that has to do with the question I cannot see. Both the Propylæa and the Erechtheion were built after the beginning of the third quarter of the fifth century,[1] and the works even of Iktinos were as perfect in Vitruvius's day as they had been four hundred years before. If Vitruvius had left us a building instead of a book, Mr. Clarke's defence would have some relevancy. His statement that Vitruvius had never been in Greece, he has failed to show to be other than the baseless assumption I pronounced it to be.

6th. Mr. Clarke devotes a good many words to proving that the temple of Zeus, at Athens, was unfinished (ἡμιτελές, *inchoatum*) in the time of Vitruvius. That I frankly admitted; but I have yet to see the proof that it had not all the roof it was ever intended to receive. The citation from Vitruvius proves nothing, being simply a list of the portions of which the Roman Cossutius was the architect. "*Cujus*," he laments, "*commentarium nullum est inventum.*"

7th. When Mr. Clarke says: "No more need be said concerning the passages from Justin and Strabo [he evidently means Pausanias] than was in my paper, to which I would refer for much Mr. Davidson has overlooked or ignored," he is making a groundless assertion. I neither overlooked nor ignored anything of the smallest relevancy, as any one who reads my criticism may easily discover.

8th. Mr. Clarke, in his pamphlet, made the rash statement that "Hyperoön galleries existed in all those Greek temples which are now assumed to have been lighted from above." To my assertion that "we have no proof that there were galleries in any Greek temple save one," he replies, "Now, to speak of Doric temples alone, there is direct literary evidence to the existence of the hyperoön in the Delphian as well as the Olympian temples." Any fear I might be affected with lest Mr. Clarke should hereafter confront me with a list of Ionic temples having "hyperoa," is dispelled when I look at the evidence upon which this now qualified assertion rests. For the existence of "hyperoa" in the Olympian temples (mark the plural!) I am referred to Pausanias, v. 11. Turning to that, I find the passage which I myself cited when I admitted that we had direct evidence for the existence of galleries in *one* temple, namely, that of Zeus. Not a word is said of galleries in any other temple, either in the Heræon or the Metroön. As to the reference (Pindar in Paus. x. 5) proving that the temples at Delphi had upper galleries, I hardly know what to say, so much does the citation of it reflect on Mr. Clarke's fairness. In the chapter referred to there is, indeed, a brief description of the Delphic temple of Apollo, and in it a quotation from Pindar. It runs thus: —

Χρύσεαι δ' ἐξύπερθ' αἰετοῦ ἄειδον Κηληδόνες,

and means, "and above the eagle (*i. e.*, the pediment?) sang the golden mystic virgins." The old editions of Pausanias, indeed, read ἐξ ὑπερῴου; but this rests upon no MS. authority, and has long since been abandoned. (See Schubart's *Pausanias*, vol. ii., *præf.*, page xx, and Bergk's *Pindar*, page 294, seq.) Thus the force of the citation falls to the ground, and Mr. Clarke has failed to produce any literary evidence that more than one temple in Greece had galleries. But he goes on to say, "It [*i. e.*, the hyperoön] is to be seen and measured in Pæstum, and he who can study so many Sicilian temples and can attempt to picture to himself the antique arrangement of the Parthenon interior, without becoming aware of galleries, must advance to the question with prejudice or with insufficient architectural understanding." This is, I imagine, a severe reflection on me; but I am in good company. Doubtless we all have insufficient architectural understanding, if Mr. Clarke, on the authority of his imagination, sharpened by the study of "so many Sicilian temples," says so; and I, for one, advance to most questions with a prejudice that forbids me to generalize from a single example. I have not seen the "so many Sicilian temples;" but I have examined, with all the care of which I am capable, those of Pæstum, and I have failed to find in them traces of hyperoa. As, however, my untrained eyes are of little authority in a matter so strictly technical, I will quote the words of M. Labrouste, member of the French Institute, who in 1824 received the *prix d'architecture*, and who five years later made plans of the Pæstum temples. He says: "Il me reste de parler des escaliers qui sont semblables à ceux que l'on remarque à presque tous les temples de la Sicile conduisant dans le comble. On conçoit, en effet, que les plafonds en pierre exigeaient une inspection assidue et une vigilance particulière. Ils ne pouvaient conduire à des tribunes intérieures, comme le suppose de Lagardette, car de semblables escaliers sont placés à l'entrée de tous les

[1] Even the Parthenon was for the most part built after this date.

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temples de la Sicile, qui, à coup sûr, n'avaient pas de tribunes dans la cella; ils servaient donc seulement à l'inspection des plafonds, et j'ai remarqué en Sicile, qu'il n'y a que le temple de Jupiter Olympien, à Agrigente, qui n'ait pas d'escaliers, et l'on sait qu'il était hypæthre ou sans plafonds." And M. Beulé, something of an authority in architectural matters, I believe, says: "L'escalier si admirablement conservé du temple de la Concorde, à Agrigente, avec ses paliers, ses rampes droites à retours, ses petites fenêtres triangulaires, nous apprend comment les anciens se ménageaient un accès dans les combles de l'édifice, prévoyant les incendies, les réparations, les besoins de chaque jour. Mais quoiqu'il y eût deux ordres de colonnes, il n'y avait point de galerie accessible au public, même dans le Parthénon, nous l'avons vu jadis (*Acropole d'Athènes*, t. ii., ch. 1) la double colonnade n'est qu'une décoration." Poor, prejudiced M. Beulé! Even Michaelis, who restores the Parthenon with galleries, does not pretend to have any authority for so doing except the analogy of the temple of Zeus, at Olympia (see *Der Parthenon*, page 23). Galleries, I am quite well aware, appear in many restorations; but, so far as I can discover, they are all purely conjectural. It would, indeed, be strange if the temple at Olympia had been the only one having galleries; but at present, I think I may say with safety, we have no positive proof to the contrary.

9th. Since Mr. Clarke was acquainted with the view of the Acropolis published in the German *Mittheilungen*, he might very easily have explained to himself how the Parthenon might, in the Middle Ages, have been covered with the original tiles, and yet that fact have "no bearing on the lighting of Greek temples," as I asserted. But he chooses to substitute for "covered" "covered completely," on the authority of Tavernier, who speaks of the roof as "*tout entier de pierres plates de marbres.*" This was doubtless true of so much of the Parthenon as had any roof at all, and the words *tout entier* mean no more; but the view in the *Mittheilungen* shows that the roof of the pronaos had entirely disappeared, and thus would have been obtained the additional tiles necessary to complete the covering of the roof of the cella, after it was raised. So I reaffirm that the condition of the roof of the Parthenon in the seventeenth century has no bearing on the lighting of Greek temples.

10th. I can assure Mr. Clarke that the explanation of the Pantheon "hypæthron" has not been thrown away. I can thoroughly appreciate its value, and I can also assure him that the small building near Karystos was not originally intended as a goat-house. I am pretty familiar with Greek goat-houses, and Mr. Clarke will be troubled to find one among them all resembling this. There is a description of this edifice in Guhl and Koner's *Leben der Griechen und Roemer*, page 7, seq., and to that I must refer.

11th. If I have in any way misjudged Mr. Clarke's essay from not knowing that it was "but the single chapter of a projected work," that is certainly his fault and not mine. When he promises not to omit "to consider any argument or testimony in favor of the hypæthron upon which weight has been laid by its advocates," he gives no hint that this is not to be done in the essay itself.

12th. On the strength of a passage which he declares to be "notoriously obscure" Mr. Clarke unqualifiedly asserts that Vitruvius refers to *two* temples at Athens as hypæthral. Until he shows how a decastyle temple can, at the same time and in the same sense, be octastyle, I shall deny this and hold that the Vitruvian passage has no bearing on the lighting of Doric and Ionic temples.

13th. That "the supposition that Greek constructors 'who could rear a Parthenon' were unable to roof temples like those of Zeus, at Ilium [he means Selinus] and Athens, ... need not be discussed before architects," I am willing to admit; it must, however, be remembered that the people who built the Parthenon did not attempt the other task, and that we have the direct testimony of Strabo to the fact that the temple of Apollo, at Branchidæ, "remained roofless on account of its size."

14th. Not able to deny that the great temple of Demeter at Eleusis was lighted from the roof, Mr. Clarke asserts, dogmatically, that it was "not a temple, but a house of assemblage," as if the two things were incompatible. However, it certainly was a temple. Strabo, Θ, 12, page 395, calls it τὸ τῆς Δήμητρος ἱερόν, and Vitruvius calls it not only *cella* (translating σηκός), but also *templum* (Bk. vii., *præf.*).[1] Its form may have been that of a basilica, as Mr. Clarke says, though that is at least doubtful. At all events it affords an undoubted example of a Greek temple lighted from the roof. I very much doubt his explanation of Plutarch's phrase τὸ ὀπαῖον ἐκορύφωσε. In any case the verb κορυφοῦν has nothing to do directly with κόρυς, the verb from which is κορύσσειν. Κορυφοῦν comes from κορυφή, and does not suggest, even "figuratively," a helmet. Again, ὀπαία is not defined by Hesychius as equal to "θυρίς, window or doorway; a vertical opening." Here Mr. Clarke garbles Hesychius, who defines ὀπαία as θυρὶς ἡ ἐκ τοῦ κεράμου, that is, a window cut in the tile roof, hence *not* vertical. The word is similarly defined by Pollux, ii. 54. I fear that if Mr. Clarke has no better proof that the great temple at Eleusis was surmounted by a clerestory than his interpretation of this passage, he will not find many converts to his view.

15th. In his remarks about the use, by Pausanias, of the phrase οὐκ ἔχον ὄροφον, Mr. Clarke again garbles my assertion by omitting the limiting clause, and so his references only go to bear me out. He evidently does not know the meaning of the term "Metroön," for he speaks of it as the temple of Metros Theos, a divinity of whom, I should like to wager, no one ever before heard. This is something for Mr. Clarke to correct in his MS. I must here omit a few of his minor arguments, holding myself ready, if need be, to show that they are not pertinent, and follow Mr. Clarke into one of his flights. He says: "The eternal principles of constructive truth and rhythmic beauty, 'æsthetic notions' to Mr. Davidson, are not of to-day nor yesterday [nothing eternal is!], but are and ever will be the same as when so eloquently expressed in the architecture of Greece twenty-four centuries ago." If I could understand these words, I might, perhaps, agree to them; but after all I might still reasonably doubt if these eternal principles had ever come into the consciousness of any human being to such an extent that he could reconstruct Greek temples by means of them. I fear they come into all our minds as "æsthetic notions," which are very unsafe guides in determining the taste of by-gone periods. It seems to me better to study the facts of ancient art carefully and minutely, and base our theories upon them, than to set out with preconceived "eternal principles," and impose them upon things which we only half comprehend.

16th. In regard to the Erechtheion, I will only call Mr. Clarke's attention to the fact that the western windows are not in the Pandroseion, but in a chamber or chambers once separated from it by a wall.

Mr. Clarke claims to have made only two oversights in his essay. I think I have pointed out many in it, and still more in his reply, and my list is not complete. I think, moreover, I have more than substantiated all my charges, and also shown that he has not yet brought forward a single cogent argument or fact in support of his theory of artificial lighting. He conceives my aim and spirit to be different from his, and I am entirely willing he should. That I did not treat him with "delicacy" is true; but the question remains whether there are not certain works that forbid delicacy in an honest critic, and whether the "Hypæthral Question" is not one of them. That let others decide. I am, dear sir,

Very truly yours, THOMAS DAVIDSON.

P. S. November 18. A few days ago my attention was called to a communication in your issue of August 30 in which Professor Norton, who wrote the preface to the "Hypæthral Question," invokes in favor of that essay the authority of Dr. Reber, of Munich, to whom he gives a very high testimonial, as the author of an "elaborate and authoritative work," etc. I had supposed that for educated men the day of authoritative works was long past, and that they had all learnt to demand facts as a ground-work for theories. What Dr. Reber's unsupported authority is worth may be judged from the single circumstance, very germane to the present question, that in his *Kunstgeschichte des Allerthums* (Leipzig, 1871), which Professor Norton considers "the best existing concise history of ancient art," he treats with sarcasm and contempt the well-established fact of the curvature of the horizontal lines in Greek temples. (See the criticism of Koumanoudhis in the Ἀρχαιολογικὴ Ἐφημερίς, 1874, page 481.) In spite of this if Dr. Reber will produce evidence that Greek temples were artificially lighted, I shall listen to him with as much respect as I should to Professor Norton himself.

T. D.

[1] One might suppose from the text of Strabo that the σηκός and the ἱερόν were distinct edifices. That they were not is clearly shown by the passage from Vitruvius.

THE TANAGRA FIGURINES.

[Apropos of our notice of the Tanagra figurines we have received the following letter, which we have referred to the writer of the notice.]

NOVEMBER 11, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — An amateur of the "Tanagra Figurines" begs for additional details regarding them, from your able correspondent of October 25, who seems to be the most original of all writers who have treated this interesting subject. It is desirable that examples should be given of figurines modelled on the higher statuary of their day, "copies or imitations of famous works," the absence of such types having been noted by foreign critics and collectors. This is a special discovery and demands publicity. It may be useful, also, to notice the moving of a certain historical date quite sixty years from its accustomed place. Will your correspondent kindly inform us whether he maintains his position on the battle of Tanagra, recalling the distinction which Sir Walter Scott is reported to have earned on the field of Waterloo. M. F. C.

[To which our contributor replies as follows:]

MR. EDITOR:

If I had known of the identification of any of the Tanagra figurines as copies of existing antiques I should have said so. The fact that there is no such identification was good cause for confining myself to simple conjecture. The reasons for assuming that the figurines did not owe their inspiration solely to the men who modelled them are artistic rather than historical. It is difficult not to believe that their style, their treatment, and often their poise and the handling of their draperies were due to the higher sculpture of their time. A few of them approach nearly enough to the character of ideal sculpture to suggest that they found their originals not in daily life, but in works which were favorites in their day, though they are not among the comparatively small number that have survived to ours.

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Hence my conjecture that some were "perhaps actual copies or imitations more or less remote of famous statues." If it had occurred to me that anybody would fail to apprehend my meaning I might have added "unknown to us," or something to that effect.

The date which I have "moved" was in correction of the book under notice, where the battle of Tanagra is set at 426 B. C. The year I had in mind was 457 B. C., which, I believe, is the received date; but writing in a haste which is unlucky in those who venture to criticise, I wrote thirty-one years *earlier* instead of *later*. Your amateur does not assume the defence of the writer whose work I noticed, and I will not accuse him of ignoring the mistake I meant to correct; but the dispassionate acumen which was quick to score the slip of my pen might profitably have instructed your public as to the other error.

THE BIRCHARD BUILDING, MILWAUKEE, WISCONSIN.

Milwaukee, November 10, 1879.

To the Editor of the American Architect:

Sir, — At a meeting of the Common Council, October 13, the following resolution was presented by Alderman Chapman: —

Resolved: That the Committee on Public Buildings be and are hereby authorized to cause a thorough inspection of the building now in the course of erection on the corner of Grand Avenue and West Water Street, known as the Birchard Building, as the same is being erected in a dangerous condition, and report the facts to this Council.

Referred to the Committee on Public Buildings.

On Friday, the 24th, the *Sentinel* published this paragraph: —

Yesterday afternoon the Committee on Public Buildings inspected the Birchard Block, on Grand Avenue, which is now being remodelled. They are of the opinion that the building is unsafe, and will recommend that the Board of Public Works be instructed to make a thorough examination of it.

At the meeting of the Council, held November 10, the matter was referred to the Board of Public Works, by the adoption of the following resolution: —

Resolved: That the Board of Public Works be and are hereby instructed to cause a thorough inspection of the building known as Birchard's Block, on the corner of Grand Avenue and West Water Street, as to its construction, and whether or not it is dangerous to the public, and report to the Common Council.

Adopted.

In the mean time the work progresses on the building regardless of resolution and reference.

The words in the resolution, "now in the course of erection," are liable to mislead those not acquainted with the building. The building has been erected at least fifteen years, but until a few weeks ago was a two-story building; now another story is added on the same old walls. The building has for many years been considered unsafe, the corner pier is settled very considerably, and the walls on each front, at the line of the second story, are bent outwards and badly cracked. Most certainly the outward appearance of the building seems to justify the words in the concluding part of the resolution, "as the same is being erected in a dangerous condition," but without a proper examination judgment cannot be rendered. That such an examination by competent men should be made, and that speedily, is the opinion of all careful builders. There is no such thing known in this city as a building inspector. We are waiting for a few murders to be committed by buildings tumbling down. It is only a question of time.

A. B.

PUBLICATIONS RECEIVED.

Illustrations of the History of Art, Architecture, Sculpture, and the Industrial Arts among the Nations of Antiquity. A series of illustrations arranged chronologically, and forming an atlas to be used with any work on the history of art. Authorized American edition, published under the supervision of S. R. Koehler. Boston: L. Prang & Co. 1879. Parts I. and II., price $1.50 and $2.25.

NOTES AND CLIPPINGS.

The Antiquity of Glass. — The oldest specimen of glass bearing anything like a date is a little moulded lion's head, bearing the name of an Egyptian king of the eleventh dynasty, in the Slade collection at the British Museum. That is to say, at a period which may be moderately placed as more than 2,000 years B. C. glass was not only made, but made with a skill which shows that the art was nothing new. The invention of glazing pottery with a film or varnish of glass is so old that among the fragments which bear inscriptions of the early Egyptian monarchy are beads, possibly of the first dynasty. It cannot be doubted that the story preserved by Pliny, which assigns the credit of the invention to the Phœnicians, is so far true that these adventurous merchants brought specimens to other countries from Egypt. That the modern art of glass-blowing was known long before is certain from representations among the pictures on the walls of a tomb at Beni Hassan, of the twelfth Egyptian dynasty, but a much older picture, which probably represented the same manufacture, s among the half-obliterated scenes in a chamber of the tomb at Thy, at Sakkara, and dates from the time of the fifth dynasty, a time so remote that it is not possible, in spite of the assiduous researches of many Egyptologists, to give it a date in years. — *Saturday Review.*

The Bridge of Lessart. — We find in the *Journal of the Society of Arts* this further account of the building of the railroad bridge over the Rance at Dinan, and not, as was stated last week, at Dinard: "The Western Railway Company of France is at present engaged in constructing a branch line from Dol to Dinan; this has to cross the River Rance at about two miles below the latter town by a single span at an elevation of about 100 feet. The method by which this has been accomplished is considered unique in this country, and deserves some notice. The iron portion of the bridge itself is of the usual diagonal construction, its length is 96.5 metres, or 314 feet, and its total weight 1,300 000 kilogrammes, equal to about 1,250 tons. It has been constructed by the Maison Joly, of Argenteuil, a well-known firm, and has by them been put together on the line of railway immediately joining the intended span. Large wheels or rollers were placed beneath the bridge, and it was determined to push or propel the bridge across the stream by hydraulic power. In order, however, to regulate this operation, and to prevent its over-topping into the river below, a portion of a viaduct of a lighter construction, intended for another section of the line, has been temporarily attached or bolted to the fore end of the main span; this is about 150 feet in length, while another section is attached to the near end of the main iron bridge. It is evident that by adopting this method the fore end of the total iron construction will arrive at the supporting pier on the further side before the centre of gravity of the main span will have passed that on the home side; it will then be supported at both ends until finally placed in position. As soon as this is accomplished, the two sections of the lighter viaduct will be removed. To M. Morse, engineer-in-chief to the railway company, is due the credit for this bold and original conception, and under his able direction and supervision this great undertaking has just been successfully accomplished."

The Palace of the Trocadéro. — It has finally been decided that the Trocadéro building will be utilized by making it the home of the Ministry of the Fine Arts.

The Railroad up Mount Vesuvius. — The latest reports from Naples represent the railway destined to carry tourists to the top of Vesuvius as progressing fast toward completion, and the walls of the station which forms its terminus are already rising above the ground. The line is to be laid along the western slope of the mountain, and will be rather less than 1,000 yards in length. The station itself, which stands at the bottom of the volcanic cone, is 2,500 feet above the level of the sea, and the line rises rapidly to the verge of the crater, at an incline which averages 56 feet in the 100, but reaches at its steepest part as much as 63 in 100. The construction of the railway has been a matter for serious debate, and it was only after long consideration that the projectors determined upon the system planned by the engineer, Olivieri. According to the principle adopted in this plan, the whole of the inclined plane, from top to bottom, is covered with a thick platform of wood, resting upon the lava and other crumbling soil, which would of itself be much too unsteady to form a proper bed for the sleepers. Above the cinders and detritus, of which the mountain-side is composed, the platform is like a gigantic raft, and upon it the rails will be laid with ease and regularity. The wheels of the carriages are to be so firmly attached to the rails that they can never jump or slip off, and the trains are to be drawn up by means of two steel cables worked by a steam engine stationed at the bottom of the volcano. They will also be provided with a brake so powerful that even in the unlikely case of the breakage of both cables they can be brought to a standstill very quickly, even on an incline of 50 in 100. The only other difficulty which faced the projectors of the new railway was that of water-supply, for it was calculated that the expense of bringing from Resina enough water to supply the engine would run away with more than all the profits that could reasonably be expected. In order to avoid this alternative, two large reservoirs are being constructed, which are expected, even under the peculiar circumstances of the position, never to run dry. — *London Globe.*

The Spanish International Exhibition. — A French architect, M. Colibert, has just been charged with the preparation of the plans of the building which will be needed for the international exhibition at Madrid in 1882.

Discovery of a Colossal Statue at Gaza. — At Gaza, on the 6th ult., an Arab was quarrying stone at a place about four and a half miles distant from the town, and unearthed a marble figure of a man. The following are the dimensions given by an Arab eye-witness, namely: "Three feet from top of head to end of beard; 27 inches from ear to ear: from top of forehead to mouth, 13½ inches; from shoulder to shoulder, 54 inches; from crown of head to waist, 81 inches; and 54 inches the circumference of the neck; the total height is 15 feet. The hair hangs in long ringlets down upon the shoulders, and the beard is long, indicating a man of venerable age. The right arm is broken in half, while the left arm is crossed over the breast to the right shoulder, where the hand is hidden by the drapery of a cloak covering the shoulders." I presume the statue is nude, though this fact is not stated. There is no inscription either on the figure or on the pedestal, and the latter is a huge block, carved in one piece with the god. It was found in a recumbent position, buried in the sand upon the top of a hill near the sea, evidently removed from its original site, which is unknown. Its estimated weight is 12,000 pounds. The Pacha of Jerusalem has ordered a guard to watch this interesting relic of ancient art, and prevent any injury by the fanatics of Gaza. Judging merely from the "long hair and long beard," and the position of the left hand, I should be disposed to assume that it is an Assyrian monument commemorative of their invasion of Palestine. But it is premature to conjecture until further and more precise particulars can be had from Gaza. — *Jaffa Correspondence of N. Y. Herald.*

A Great Conservatory. — Possibly the largest private conservatory in the world is that recently completed for the King of Holland in the Schloss Park, adjoining his favorite country residence. It contains about 46 000 cubic yards of space, while its glass dome is 90 feet in height and 180 in diameter. This is flanked by two lofty towers resembling Turkish minarets in shape, which give an Oriental character to the whole structure. The hot-water pipes laid down for its heating are 15,000 feet long.

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THE thirteenth convention of the American Institute of Architects, held in New York last week, differed somewhat from the usual habit of the conventions in the little prominence of the business element, — we had almost said its suppression. Important questions of government and of official action were laid before it, but the Convention seemed unprepared or indisposed to discuss them with any thoroughness, and they were mostly decided with a tranquil promptness that savored of the perfunctory, or referred without recommendation to committees. Indeed, there was hardly anything that could be called a debate, from the opening of the sessions to the final adjournment. This gave the meetings a somewhat languid air, which contrasted with the animation of former conventions. At the same time, it certainly favored the dispatch of the business that actually came before the meetings, and it gave to the papers that were presented the elbow-room that they have wanted in previous years. Some of the papers justified the importance of the position thus assigned them, others did not; but from the point of view from which the managing committee evidently looked at the matter the sessions of the Convention were excellently arranged; the proceedings and the papers were agreeably varied, the work of the Institute was done in a business-like manner, and the patience of the members was not too much taxed nor their interest wearied by the predominance of either element, as often happens in conventions. All this agrees with a change which has seemed to steal over the Institute conventions in the last two or three years, making them more like the conventions of other associated bodies than they used to be, by reducing the attention given to executive business to a minimum, and fixing the interest of the meetings chiefly in its literary exercises. As to the desirability of the change, there will probably be a difference of opinion. Naturally, it may be said, the less the time of such a convention is taken up with the mere details of internal administration, and the more its attention can be given to matters of permanent interest to the profession, the better. On the other hand, in a profession so actively engaged in the business of the community as ours, and one whose relations to the world are in some respects still undetermined or unrecognized, the matters of permanent interest constantly include questions which are not to be settled without debate, and are the better for general discussion. So that the tendency to decide questions offhand, or by reference to committees, which appeared this year, and which is in place perhaps so far as the questions concern only the internal polity of the Institute, as they mostly did this time, is to be deprecated, so far as it tends to make the character of the sessions purely literary, and to discourage altogether the habit of discussion.

THE officers chosen for the coming year were as follows, most of them being those of this year: President, Thomas U. Walter; Treasurer, O. P. Hatfield; Secretary, H. M. Congdon; Secretary for Foreign Correspondence, W. P. P. Longfellow; Trustees at Large, C. C. Haight, J. C. Cady, R. M. Hunt, W. A. Potter; Committee on Publications, E. T. Littell, T. M. Clark, A. J. Bloor, J. McArthur, Jr., R. M. Upjohn; Committee on Education, Russell Sturgis, Jr., W. R. Ware, N. C. Ricker, Joseph M. Wilson, H. H. Richardson. The most important pieces of executive action were, an order passed giving the Board of Trustees power, on the recommendation of their report, to waive the proscribed formalities (not the conditions) of membership, and elect fellows directly at their discretion from among qualified architects; a proposition to form a new grade of non-professional life-members, which was referred to the Trustees; and a resolution directing the Trustees to consider the question of dissolving the present Chapter organization, so as to leave the Institute, as it was in its earlier days, a body consisting entirely of members at large, and if, after consulting the Chapters, they decided in favor of the change to report the necessary alterations in the law of the Institute for action at its next convention. This proposition was the outcome of a recommendation in the report of the Committee on Membership, and was directly suggested, we believe, by symptoms of disaffection on the part of the Chicago and Cincinnati Chapters, which had failed to convert the Institute to some desired legislation; the Cincinnati Chapter, with no fear of coercion before its eyes, having sealed its devotion to its lost cause by a deliberate secession. A special committee was appointed to collect and present to the next convention records of the architecture of the Colonial period of the United States and of the first fifty years of their independence, and another for "the consideration of the best solution of the Tenement-House Problem, especially as it is presented in the city of New York."

THE papers read at the Convention will in their order be printed in the *American Architect*, as usual. President Walter's address we hope to give in this number. Professor Chandler's informal lecture during the visit of the Convention to Columbia College was not written out, and was a very clear and straightforward setting forth of the present and past condition of the tenement-house question in New York, illustrated with many plans of such buildings as they have been and as they are now proposed. It was made plain that the Board of Health in New York had no easy duty to perform, and that, whatever evils may be necessarily tolerated at this day, there is really a tendency to a considerable improvement on the old state of things. The main difficulty with which the board has to contend in its oversight of plans is naturally the eagerness of owners to house more families than their lots will provide room for, the restrictions in construction being to them a subordinate matter. There is a constant effort, as the lecturer showed, to shirk the conditions of the law, which require that not more than sixty-five per cent of the lot shall be covered, and that every room shall have a window opening to the outer air. The sixty-five per cent restriction, which is open to modification at the discretion of the board, subjects the board to a pressure that makes its position a difficult one. The open wells, — slots, we may fairly call them, — which are provided for aeration of the inner bedrooms in many of the plans presented for approval, and the windows that look into them, are ridiculously small, so that a minimum area of twelve square feet has been fixed for light and air shafts, and the same for the windows opening upon them; a minimum, however, which seems to require further definition in practice, since a slot of one foot by twelve, or one and a half by eight, such as is actually proposed for a light well in some plans submitted, would be obviously intolerable. A further proposition is to require that each shaft shall have an air-duct of at least three feet section leading from its bottom through basement or cellar to the outer air. Such a provision is not always easily carried out, but something like it is essential to making the shafts of any use at all for ventilation. On the whole, the conclusion is inevitable that the New York lot of twenty-five by a hundred feet is not suitable for the use that is demanded of it, that is, for housing four families on a floor; and the thing to look forward to is a law against building on such lots houses containing more than three tenements to a floor. This will amount to a prohibition from building tenement-houses on such lots when they are too valuable to yield a paying rent under this restriction.

WE have more than once expressed our admiration at the complacency with which the modern Italian measures himself against the great men of his country's great days, the confidence with which the restorer spreads his hasty patchwork over the noblest paintings of her old masters, or tacks a coarse and cheap-looking new façade against her mediæval buildings. English papers, and even American ones, have of late rung

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with complaints of the indifference with which old landmarks and noted buildings are damaged or removed in the alterations that are now going on in Rome. But none of these degradations are quite so important or offensive as the project that is now brought forward to rebuild the famous front of St. Mark's at Venice. The letter from Mr. Morris, which we quote in another column, contains what we must assume to be a true account of the danger. We cannot wonder at hearing a general protest from persons who care for the beauty, the example, the historical teaching or associations, of the most beautiful and the absolutely unique one among the churches of Venice. For once, at least, all such persons will agree with the English Society for the Protection of Ancient Buildings in the protest which they have made against the restoration, and it is pretty safe to say that there is hardly an architect — outside of Italy, at least — who will not have a sense of personal grievance at the hopeless injury which he knows will be done if the restorer gets at work upon this front. Mr. Morris's letter says that the commission which is to discuss the fate of it this month will decide whether the destruction and reconstruction are to begin this year or next. There is room to hope that the approach of winter or some other cause may incline the commission to put off the work for the year, which will allow time for earnest protests from people of all countries. The agreeable confidence which is inspired by the tradition of past greatness, that no foreigners, *barbari tedeschi* or others, can offer any advice worthy of the attention of Italy in matters of art, may close the ears of an Italian commission against such protests; but if the civilized world outside of their country should express with unanimity the distress which it will unanimously feel, the commission might hesitate to fly in the face of universal disapproval.

The lover of Venice who goes back there in a year or two will be sufficiently disturbed by the other alterations which she has taken in hand. Already in many places smaller canals have been filled up to make streets, the original streets of Venice, which are numerous enough, being too small for modern uses, — not so wide as the sidewalks in most other cities, in fact. The Calle San Moisè, we are told, the picturesque way which leads westward behind the Grand Canal from the great Piazza of St. Mark, is now under transformation into the likeness, as far as may be, of a Parisian street. These changes, and the building of a causeway across the lagoon to the mainland, are intended to open the city to carriages. However much those who love the old Venice may deplore these alterations, and wonder at the perverse wish of the Venetians to exchange their gondolas for carriages, we must accept the changes as inevitable, if the city is to be checked in its decline and to recover any of its old prosperity. The world prefers bustle, luxury, and wealth to repose, beauty, and poverty, nor can we expect the Venetians to differ from it in this. The streets and canals that were sufficient for traffic in the small and costly wares of the fourteenth century are not enough for the hurrying, bulky commerce of the nineteenth; and under the guise of commercial improvement more or less needless devastation will inevitably be done. But St. Mark's is, or ought to be, entirely aside from this movement, and its claim to be unchanged is perhaps unequalled. We do not think at this moment of any existing building, unless it is St. Sophia at Constantinople, whose position in the history of art is so significant and the preservation of its testimony unimpaired so important. It is an epitome of the architectural development of Venice from the tenth century to the fifteenth, as yet comparatively undisturbed by modern alterations, and the associations of all her history are wreathed about it. That the modern Italians, with all their patriotism, should be so dulled to such appreciation as they are is a standing wonder to foreigners. But the greatest value of St. Mark's, after all, is as a work of art, and here it has no rival. As a piece of purely architectural design the façade has less importance than is commonly ascribed to it. Its detail, however, is of the greatest interest and beauty, and as a work of color it is the crowning glory of Italian architecture, and is absolutely without parallel in the world. This color is the work of centuries of existence as well as of man's hand, and it would be no more possible to restore it than to replace the cloud which the wind has swept away from a sunset sky. What the probabilities are we may see from the paltry effect and dreary color of the restorer's work on the north flank of St. Mark's, where it adjoins this same front. If the modern Italian will improve his old architecture there is a plenty of work by Borromini, Bernini, Maderno, and the like, which he need not be afraid of spoiling, but he seems to itch to lay his heavy hand on his noblest inheritance.

One often hears it said of the great works that have come down to us from past ages, as of natural features of great beauty and renown, like Niagara Falls, that the public as well as their actual possessors has acquired a right in them, so that their owners are not at liberty to convert them or ruin them so as to destroy the general enjoyment of them. This is in a certain way true, in that to needlessly interfere with such buildings or features is an unjustifiable injury to the world. But to secure consideration for any such proscriptive interest the world should be prepared to assume a corresponding responsibility. The public which expects an owner to waive any of his rights over this or that monument for its enjoyment should be prepared to share with him the expense of its conservation. If the world is really interested in saving the present front of St. Mark's from a renewal that would amount to a destruction, it may fairly be asked to provide some other treatment for it. No protest in its favor would be half so efficient as one that was backed by the offer to provide for its security and maintenance in its present state so far as possible. That something will be done to it can hardly be doubted, and we believe that a certain amount of careful reparation is actually necessary to keep it from going to pieces At any rate, it will be pretty surely taken in hand, and the question of most interest practically will be, whether it shall be strengthened with a reverential care, preserving its worn capitals and richly tinted mosaics as tenderly as possible, or whether it shall be restored in the drastic manner that we see in the reno vation of the Fondaco dei Turchi, and of its own north side. Italian cities to-day have many new things to do, and not too much money to do them with; it may be that a protest from without against the renewal of this façade, if it were accompanied by a liberal subscription for its conservation, on condition of as little substitution as possible, would save the rebuilding, when a protest alone would not. There are those, no doubt, who would rather see it moulder away than have a stone replaced. We may be sure that this will not be allowed, and that the utmost which can be accomplished will be to hold the restorer's hand, making him bind together the loosening fabric as carefully as he can, and with as little patching as is consistent with security. The right kind of conservation is costly, — as costly as renewal, perhaps; but there must be wealth enough among the myriad people who are interested in preserving St. Mark's to make it an easy thing for them to provide means for it, if they will. Here is a possible chance for Mr. Ruskin, or any other friends of the great Venetian church, who are influential enough to give direction to a public movement, and who may be willing to secure the best that can be secured, even if it may not be all they could desire.

A correspondent has sent us for comment a letter which he received from the auditor of Palo Alto County, Iowa, inviting him to submit plans in competition with other architects for a county jail. The cost of the building is set at twelve thousand dollars, and the board of supervisors offer to "pay not to exceed fifty dollars for the plans, specifications, with detailed drawings, adopted by them, and nothing for the others." We have always argued that this misappreciation of an architect's work is owing more than anything to the behavior of architects themselves, and that if architects refused, like our correspondent, to work for such pitiful remuneration, people would soon cease asking them. The sum offered by the board of supervisors is about one eighth of an architect's proper fee for such service; but if this board finds architects willing to work for it, we may not wonder if the next board offers no more. It appears, indeed, that architects will always be found who will give their work, such as it is, for pretty much anything that is offered, and the next thing to be desired is that architects should make as clear as possible the difference that is to be expected between work that is paid for on this scale and that which commands a reasonable remuneration. The way to do this is for architects who value their work and do it faithfully to let it appear that a distinct line is drawn between them and those who can be enticed by any trivial bait that committees may choose to throw out. There will always be in any community persons who prefer cheap wares to better ones, some from poverty, and some because they do not appreciate the better ones; but if the public is once brought to recognize that there is a corresponding differ-

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ence in value of service between the architects who snatch at work for a pittance and those who expect what experience has decided to be reasonable pay, the way of the conscientious and capable in the profession will be easier.

THE THIRTEENTH ANNUAL CONVENTION OF AMERICAN INSTITUTE OF ARCHITECTS.

PRESIDENT WALTER'S ADDRESS.

Fellows and Associates of the American Institute of Architects: —

It devolves upon me to-day to open our Thirteenth Annual Convention with an address; I shall therefore proceed to discharge that duty.

These annual reunions afford us opportunities for the interchange of views in relation to our art, that cannot fail to be interesting as well as profitable.

The changes that are going on in all the elements of design and construction present subjects for discussion which demand our earnest attention. While we seek to enlarge the sphere of ennobling influences to which architecture is peculiarly addressed, it becomes us to confer freely on the aspect of the present methods of embodying architectural thought, both as relates to æsthetic handling, and to scientific construction.

The objects of our meeting are, substantially, the transaction of business growing out of our corporate relations; the general advancement of architectural science; the progress and improvement of the cognate arts, and whatever may tend to promote the interests of the profession. The reports of the Board of Trustees, and of the several Chapters, will be duly laid before you, and we hope to be instructed by the reading of interesting papers by the members.

The Institute, as a scientific and professional organization, appears to be exerting a decided influence for good on the public mind, in all matters pertaining to our art; and its usefulness in promoting a proper degree of fellowship in the profession is every year more apparent.

There has been considerable architectural activity throughout the country since our last annual convention. It should, however, be remarked that but few buildings having claims to magnificence have been projected, though many grand and costly structures, commenced in former years, have progressed with satisfactory results.

Works of more recent date exhibit a freshness in their architectural handling that seems to indicate the advent of a new era in the arts of design. The manifest tendency of architects to break away from the trammels of conventional rules, and to make style subservient to the spirit of the age, indicates a progress in the development of independent thought hitherto unknown. Architecture, both in this country and in Europe, is obviously in a transition state. What may be the result of this new departure remains to be seen; if, however, architects are careful to design their works on true æsthetic principles, and in conformity with the sciences which underlie our art, it is not likely to be regretted that they show a disposition to do their own thinking.

Classic forms and classic combinations are everywhere yielding to more ornate compositions bearing the names of Queen Anne, the Stuarts, the Jacobean, the Italian Renaissance, the style called "Eastlake," which it would be difficult to define, and other fashions of building having no trace whatever of paternity, either ancient or modern.

It is, however, greatly to be regretted that a good deal of the architecture of the present day gives but little evidence of conformity with æsthetic principles. We find modern compositions, both in this country and in England, having a decided flavor of the old English Renaissance, or Elizabethan type of building, but which manifest a lamentable want of vigor in the form of their masses, and an aggregation of trivialities in the making up of details, which awaken emotions in the cultivated mind that are anything but pleasing.

The largest license in architectural composition is undoubtedly admissible, provided it does not degenerate into the production of forms and combinations that do violence to the elements of *fitness*, *beauty*, and *stability*, which, in all cases, are essential to successful building. The *first* involves the planning of our works so as to fulfil the requirements, and promote the comfort and convenience, of our employers; while the *second*, which embraces, in the fullest extent, the philosophy of architectural propriety and taste, tends to results that ennoble and elevate our science; and the *third*, comprising stability of construction in all its ramifications, insures the safety and durability of our work.

As regards the peculiar claims of domestic architecture on the skill of the profession, they are undoubtedly greater than they have ever been before; and it is only by becoming thoroughly acquainted with the increasing requirements of the age, in reference to buildings intended for domestic purposes, that an architect can keep pace with the progressive elements of his profession. Improved processes for warming and ventilating buildings are continually being developed, and questions relating to drainage, to the disposition of sewer-gas, and to other sanitary appliances that are now profoundly occupying scientific minds, should be regarded by the architect as objects of study that demand the most serious attention.

It should also be remarked that the requirements of modern civilization and taste are not to be met without an intelligent knowledge of what is going on in the outside world in relation to improvements in building appliances. We have now a thousand and one inventions which furnish us with every conceivable object of usefulness and beauty in the building art, of better design, of better materials, of better workmanship, and at cheaper rates than were ever known before; it is therefore to our interest to keep abreast of the times, so as to utilize all modern devices for the perfection of our works.

In relation to the present status of the Institute, and its outlook for the future, I have the satisfaction to say that it is evidently exerting a decided influence for good on the public mind in all matters pertaining to our art, and that architects in general are deriving from it, directly or indirectly, advantages that never could have been realized if the profession had remained without a corporate existence. It therefore becomes our duty to seek to enlarge our field of usefulness by increasing the membership of the Institute until it embraces respectable practitioners in every considerable centre of civilization throughout the country.

It is greatly to be regretted that a large number of respectable, and in many cases distinguished, architects in our most important cities have never yet become members of the Institute; while it is known full well that many who are outside of our organization are not inferior in professional standing to any who are within it. It would be well, and in no small degree courteous, if steps were taken, by making exceptional modifications in our terms and processes of admission, to receive all such into the membership of the Institute upon their expressing, in writing, a desire to that effect.

Whatever promotes the consolidation of the profession tends to lead the public to a higher appreciation of architectural genius, and to inspire confidence in the principles which govern scientific building.

The peculiar relations of architecture to civil life render it desirable to institute popular educational processes by which the public mind may be reached and instructed in the general principles which govern fitness, propriety, and good taste in architectural composition.

Unlike other professions, architecture primarily addresses the eye, and its developments are always exposed to view; it is therefore incumbent on us to enlighten the public in reference to its æsthetic elements as well as to the sciences which underlie its practice, and to its historic relations. This may be done by illustrated lectures, by popular articles in our architectural publication, and in scientific and other periodicals.

This subject has often been alluded to in the proceedings of the Institute, and in the chapters, but we have never yet taken any concerted steps in this direction.

The architectural training pursued in many of our educational institutions is important, as far as it goes, but it fails to reach the general public. I would therefore suggest that regular courses of public lectures on architecture, with proper illustrations, be delivered under the auspices of the several Chapters during the winter months by such of the fellows of the Institute as may be willing to perform that service.

I am aware of the labor involved in such a process of teaching, but I have no doubt that it would work a revolution in public sentiment regarding architecture, and at the same time greatly promote the interests of the profession.

By directing our energies to the accomplishment of the objects for which we are associated, even though it may require labor and self-sacrifice, we shall be accumulating as well as dispensing knowledge by which our sphere of usefulness in the practice of our art will be greatly enlarged, and those who call upon us for professional service will entertain a more intelligent and proper appreciation of our works.

Having said all that appears to be necessary by way of formally opening the convention, it remains for me to congratulate you on the return of our annual convocation, and to recognize with gratitude the goodness of Divine Providence in bringing us together, at the close of another year, to do fresh work for the advancement of the interests of our profession. Let us endeavor to improve the opportunity thus afforded us, so that our deliberations may tend to enhance the dignity of the Institute, and to enlarge the field of its usefulness.

THE HUNT EXHIBITION AT THE BOSTON MUSEUM OF FINE ARTS.

Years, doubtless, will pass before Mr. Hunt's abilities can be calmly and impartially reviewed. We are too near the catastrophe coolly to discuss the merits or demerits of our distinguished confrère. The public is now in a laudatory vein, and intolerant of criticism. "God save you from the day of praise" (meaning the day of your death and consequent panegyrics) is an apt Italian proverb, which proves that the custom of eulogizing the departed is not confined to our countrymen. Any attempt to assign to Hunt his true position among living or dead painters would be premature. This will be the task of our successors. Yet there is so much that is instructive in the present exhibition of his works, that the cause of education, not to mention the distinction of their author, calls for some notice of them, even though it be unsatisfactory. Both in quality and in quantity the display is noble, — a display of which Boston may justly feel proud. Its success has in no small measure been assured by

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the energy and liberality of the museum authorities, who have invariably been generous in the furtherance of art.

Were we obliged to sum up Hunt's characteristics in one word, that word would be sensibility. It explains almost all the phenomena to be found in his work, and solves the toughest problems. Take, for instance, the pictures from one to eight inclusive. How else could we account for their diversity? No. 1 is in the style of Millet, No. 2 is different from No. 1, and totally different from No. 3, which reminds us of many a head we have seen in the Italian palaces, bearing the date of the last century. No. 4, again, is in the Millet style, and No. 5 in anybody's style except his own. No. 6 savors of the Normandy school, No. 7 is treated in his Newport manner, and No. 8 is unlike all the preceding.

Hunt first felt the influence of Couture, and the result was La Marguerite (No. 101). Later he worked under the auspices of Millet, and the result was La Marguerite (No. 128). The former is more graceful in movement, more harmonious in line, truer in tone and "value." The latter is characterized by softness of outline, as well as by great breadth and simplicity of accessory. Compared with the latter, the sky and background of the former look "tortured" in treatment. Compared with the former the landscape of the latter seems rudely massive, like the clay prototype of the marble statue in its elementary state, the forms indicated, but unmodelled; or, better still, like the completed work in stone, corroded by time and the elements, the detail gone, the general forms alone distinguishable.

In order to arrive at a more complete understanding of these styles it will be profitable to describe the respective methods of the two masters. Couture proceeded in this wise: Having completed the charcoal drawing, he prepared a sauce, half cooked oil *(huile grasse)* and half spirits of turpentine. This was his vehicle for the bitumen (or as a substitute ivory-black and burnt sienna, ivory-black and light red, etc.), which he applied with a long, supple, sable brush for the outlines, and with a bristle brush for the shadows and mezzotints. When this preparation was "tacky" (not quite dry), whatever he had to paint he painted *alla prima*, that is to say, in one sitting. The high lights he placed on the unprepared parts of the canvas, and by crushing the same colors into the prepared mezzotints he obtained most beautiful cool-gray half-lights. For the shadows he avoided white and painted vigorously into his preparation with comparatively positive colors, the undertone harmonizing and subduing them. His palette was very simple; he rarely mixed more than three, and usually two, colors together. This frank treatment gave great splendor to his work. Later in life he adopted other methods, but these do not concern us now. Millet's processes were almost diametrically opposed to Couture's. Where Couture was frank Millet was labored. Couture detested the retouch, Millet adored it. The latter's work has all those qualities which frequent repaintings yield, — air, softness, mystery, and, in a measure, uncertainty of outline. Couture's performances are distinguished by freshness of color and precision of form. The latter's characteristics are essential to the decorative-monumental painter, and it is Couture's, not Millet's, influence, that we feel in the Albany work. We cannot help thinking that Hunt placed Millet on too high a pinnacle. He certainly had his qualities which his countrymen recognized. In Paris he is fairly estimated. All honor to him as one of those hardy pioneers who gave the death-blow to a false and stilted style. He was *par excellence* the interpreter of peasant life; but peasant life is not the *ultima Thule* of art. When Hunt turned with enthusiasm from *genre* to creative work he must have felt that he was exchanging a narrow for a boundless art; the limitations of the eye for the illimitable scope of the imagination. Then it was that he instinctively felt the precepts of the author of La Décadence des Romains. But little attention is paid nowadays to the durability of pictures. Should modern works of art perish, Hunt caustically remarked, humanity would be the gainer. For the majority of such works this doubtless holds true. But who is to be the judge? To keep the few we must preserve the many. The blackening and cracking modern canvases in the Luxembourg Gallery, compared with the ancient but well preserved *chefs-d'œuvre* of the Louvre, should warn the rising generation that the methodical and direct processes of the old masters cannot be exchanged with impunity for the eclectic methods of to-day. Millet's manner in this respect is dangerous. Vehicles and frequent paintings produce those chemical changes that tarnish and split the pigments. Couture's palette and handling, on the contrary, are admirably adapted to a long and healthy life, if we may apply such an expression to inanimate things. We except, of course, his use of bitumen, a color to be avoided. Pictures Nos. 4, 7, 10, 13, 29, 35, 57, 99, 128, to go no farther, are all painted in the Millet style, — a style easy for the tyro to recognize. In La Marguerite (101), The Hurdy-Gurdy Boy (130), The Fortune-Teller (83), and The Prodigal Son (67) we perceive the influence of Couture. In some respects Hunt improved on Millet's manner. The latter's woolly forms and rough-hewn members are often offensive. The pupil worked and modelled better than the master.

In 1855 he returned to America and settled in Newport. As LaFarge was at that time a student in Hunt's atelier it is fair to presume that the former acquired the latter's style. How like LaFarge is Moonlight (166), and a House in the Snow (148)! It is interesting to know that LaFarge's landscape style is Millet's filtered through Hunt.

Happy the moment Hunt was inspired to paint the Portrait of a Child (45), the *bijou* of the exhibition. Quiet, dignified, full of character is the picture of this little person. No seeking for the effects so much in vogue, thanks to our Salons, Royal Academies, and National Galleries, no obtrusive relief, no "*technique.*" To the materialistic, coarsely-painted portraits of the day, in the presence of this sympathetic child, we feel inclined to exclaim with the Latin poet, "*Procul, O procul.*" It is our purpose to analyze Mr. Hunt's genius rather than to criticise its products. Were it not so we should extol the imposing portrait of Chief-Justice Shaw, — stern personification of everlasting law and order. The canvas proclaims its own triumph.

Always impressionable, Hunt yielded to his American surroundings and devoted much of his time to landscape. Twenty years ago in this country there was but little incentive to treat the figure. Why should we regret it if we are repaid by such delightful bits of scenery? Every phase of shifting nature seems to have captivated him. Now he is enamoured of placid streams, now of sunlit woods, now of pastoral scenes. Here he revels in blinding light, there in murky skies and malignant waves, as, for example, in No. 157, Storm at Manchester. At one time he reminds us of Corot, at another of Diaz, Daubigny, and Courbet with his palette-knife execution. How much better all this than constantly harping on the same chord. Hunt would be what the French call an *impressionist*, did he not occasionally deign to finish. The true impressionist scorns good work. His idea is to give an impression of tone, of light and shade, of "value," of everything, in fact, save finished form. Hunt, on the contrary, was a cunning workman when he chose to be. Look at the crayon drawing of Chief-Justice Shaw, or at his cameos!

It is well known that painters, as they grow old, grow likewise impatient of finish. This is natural. It is also true that directness of handling, detestation of processes, and a generous use of *pâte* (as the French say) come with years. Artists, when young, are prone to employ glazes and transparent pigments. As they wax old they prefer the use of fresh paint, little fearing its crudeness. To take an example: Most visitors to the Luxembourg remember Ziem's Venice, its rich and transparent tones. Compare that canvas with his later works, painted with brilliant but opaque colors, or transparent colors applied opaquely. Couture had the same tendency. So has Bonnat. So had Hunt. Note the difference between his Millet pictures, his Newport studies, and his later works.

As we have before remarked, it is not our purpose to discuss individual pictures. Any one who expects to find in this brief notice a hand-book to the gallery will be disappointed. Yet we cannot refrain from singling out two typical landscapes, both of the impressionist order, namely, Gloucester Harbor (100) and Cattle Ploughing (12). The marine piece vibrates with dancing light. Nothing could be brighter. Students would do well to study it. Standing on the steps leading to the Allston room we had the good fortune to compare it on the spot with Turner's well-known Slave Ship, before the latter was removed from the museum. Turner was striving for color and light; Hunt only for light. The one for scenic effect; the other for truth. As far as light is concerned, how superior the Hunt! He obtained his brilliancy by force of "values;" Turner by means of vermilion, lakes, and gamboge. In No. 12 we have a vivid impression of gleaming cloud and dark earth. Any one can see that the cloud stands out unduly; that it comes before his figures. But that is not the question. All art is in a way an exaggeration. Hunt saw a snow-white cloud over a red-brown hillside, with cattle ploughing. This impression he was bound to give, should the cloud come out yards before the frame. Therein he was an "impressionist."

Still insisting on his sensibility, we see in the Boy with Violin (27) notes of color, suggested by Duveneck and the American-Munich school. In Nos. 63 and 66 (Portrait of Mr. Schlessinger and Nico'o with Mandolin) we have reminiscences of the Venetians, though certainly not of their methods, for Giorgione, Titian, and their followers glazed freely, whereas these pictures are executed with opaque pigments. In No. 85 (Elaine), strange as it may seem, we have actually a type of the Burne-Jones school.

The charcoal drawings and pastels throw no new light on Hunt's characteristics save in one particular, to which we shall presently refer. As a material charcoal was admirably suited to his temperament — nervous and excitable — he could rapidly give expression through its agency to fleeting effects of Nature and to the "moods of the moment." This is aptly illustrated by the Whirlwind (206), by the well-felt Head (225), or by the Girl at Piano (294). No. 230 (The Fagot Gatherer) reminds us of Edouard Frère, and No. 311 (July, — not a pastel, by the way, as the catalogue says) is an experiment in a new direction, an oil-painting *à l'aquarelle*, a process much in vogue with Fortuny and his school, which consists in painting frankly on a white ground, and even allowing the ground to show in places.

No. 310 (Cow, Autumn) is a perfect pastel. We prefer its delicate low-toned sky, the autumnal trees, the simple anatomy of the landscape, with its well-defined planes, to the somewhat confused and brush-marked oil (No. 72) which treats of the same subject, though the cow in the latter is admirable.

The most casual observer must have noticed a great change in the color of Hunt's last works. For convenience' sake we shall call this

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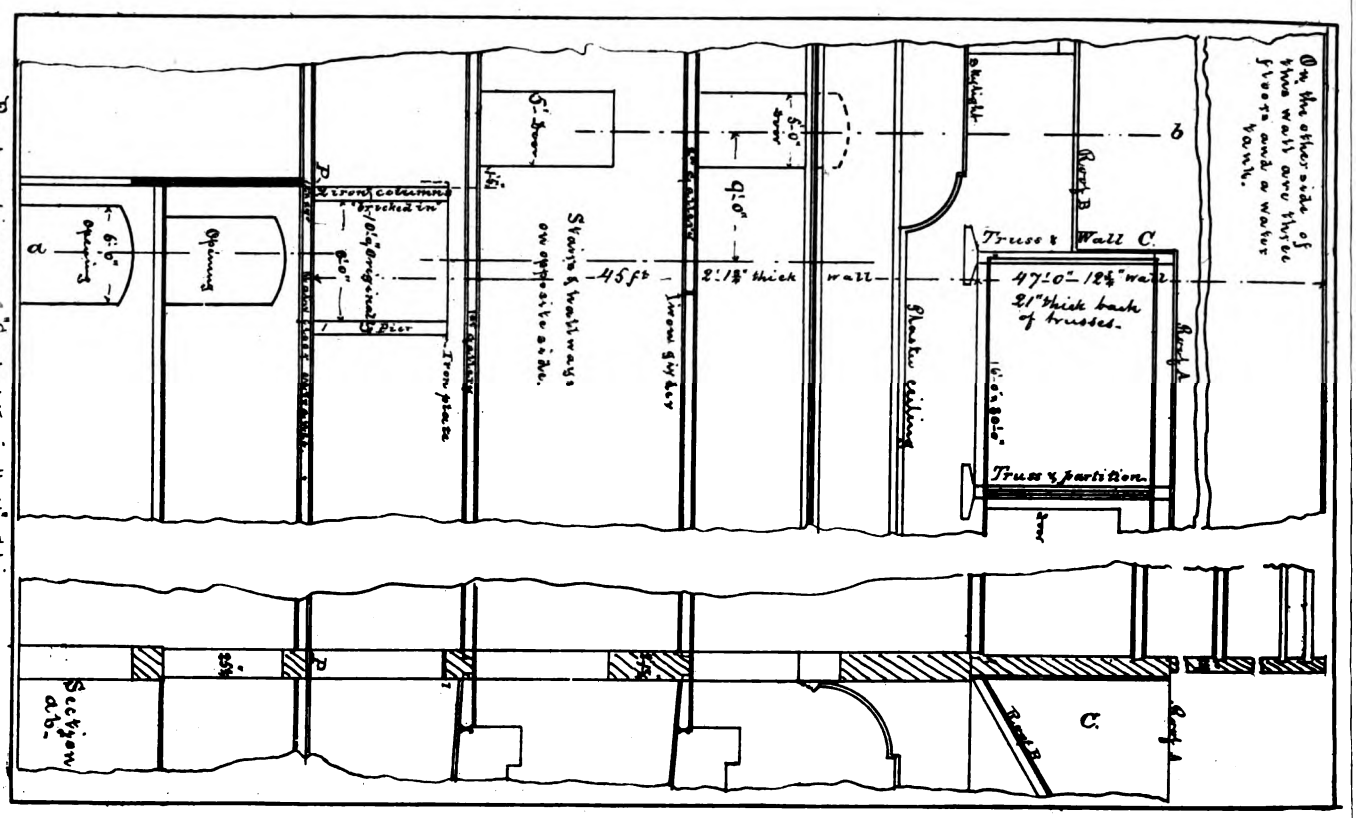

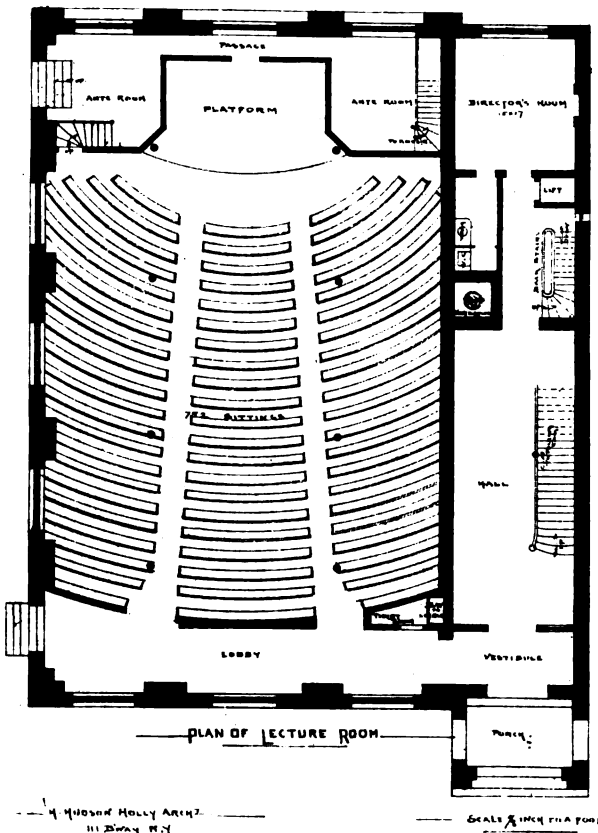

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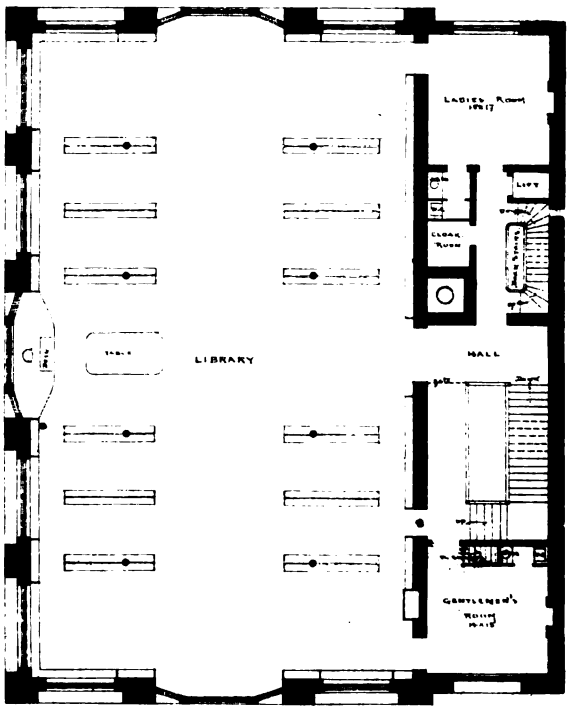

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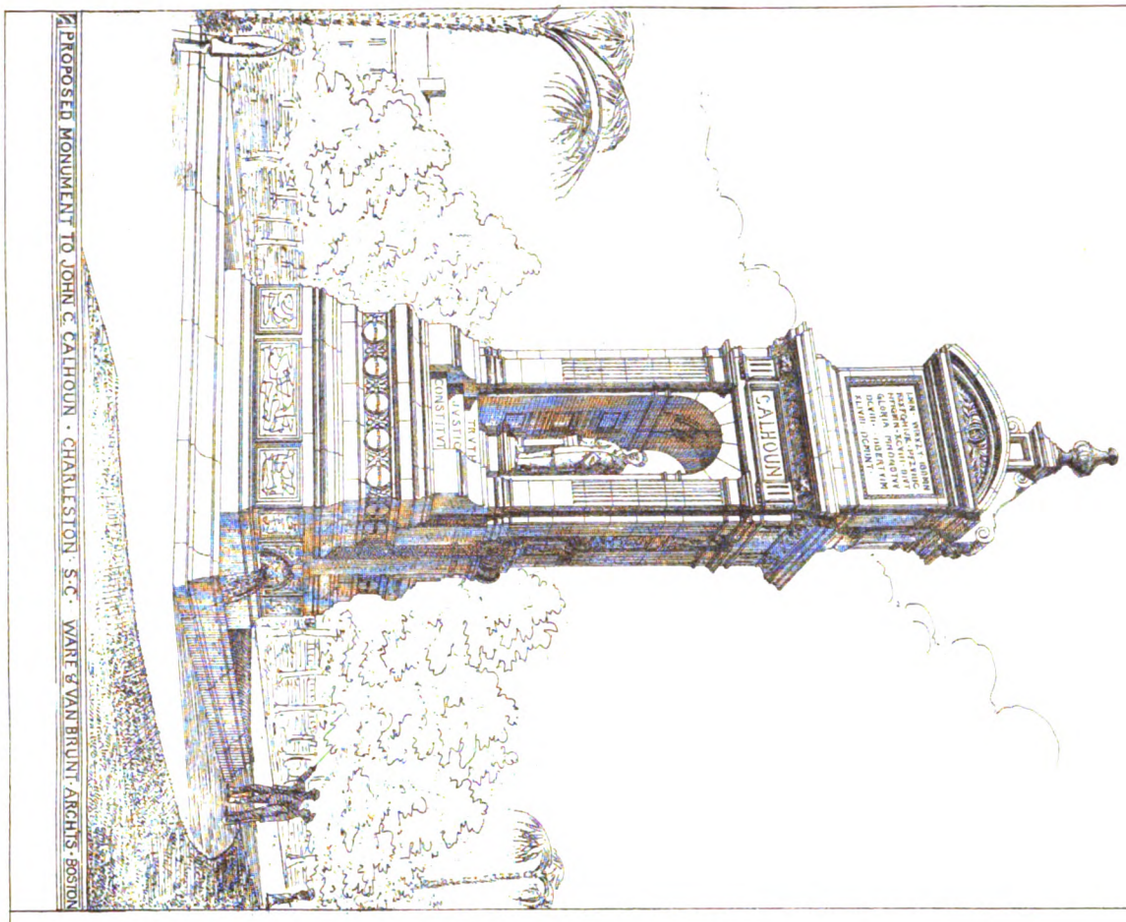

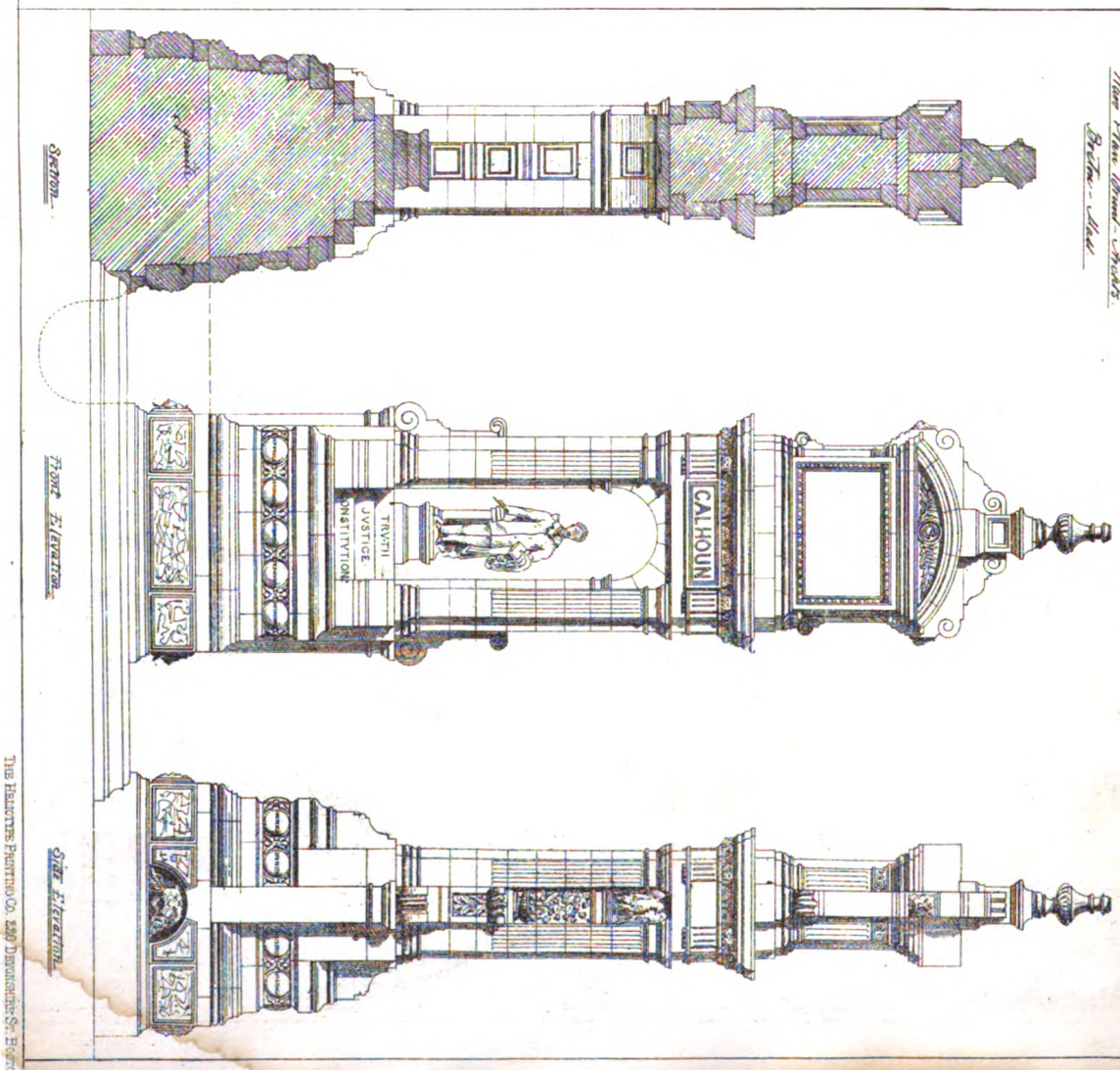

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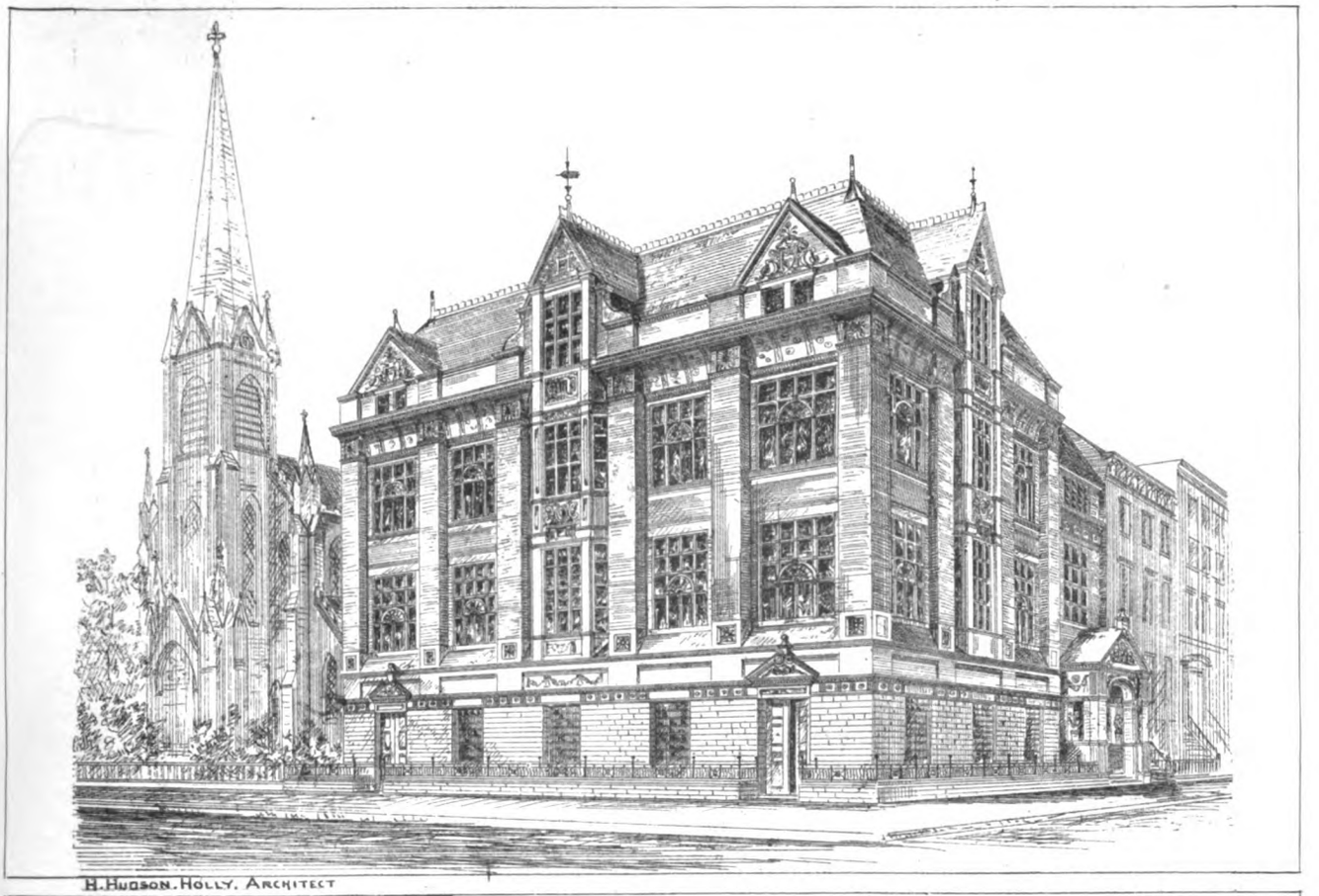
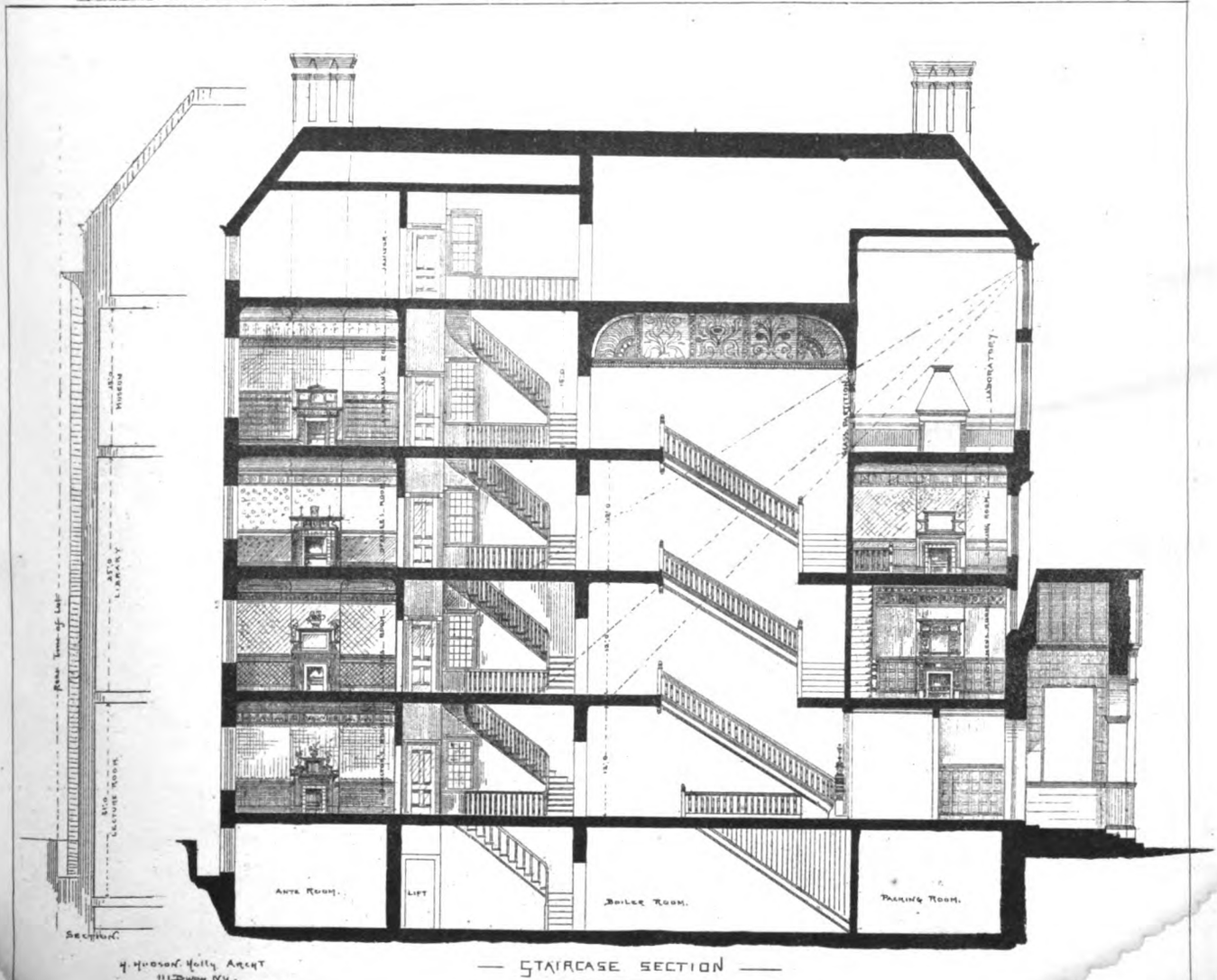


H. HUDSON. HOLLY. ARCHITECT



— STAIRCASE SECTION —

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

COMPETITIVE DESIGN FOR THE LONG ISLAND HISTORICAL SOCIETY'S BUILDING.

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his Albany period. In these works it is interesting to note that there is a close resemblance in the quality of their color to the quality of the color of a pastel. We have not seen the Albany decorations, but we have conversed with those who have been more fortunate. We have examined the preparatory sketches and cartoons, as well as the photographs, of the originals. Their color is not that of a fresco, semi-transparent, semi-opaque, but opaque like that of a pastel. Bearing in mind that his studies were made in that material, we cannot but come to the conclusion that the final work at the Capitol was sensibly affected by it.

Before closing this article, even at the risk of being wearisome, we must insist on Hunt's sensibility. He was very impressionable, and, consequently, in a measure poetic. We do not consider him highly original, or imaginative, or creative. To sustain our opinion we could cite several pictures where he has put his creative powers to the test. As dilettanti and artists understand the word, he was not a colorist, but rather a lover of tones. As a draughtsman he was bold. His pictures teem with life. His large compositions are picturesque, in the best sense of the word, rather than ideal. Above all, he was an artist; not soaring into the lofty realms of creation, but never degrading himself with materialism, never dealing in the commonplace; an artist of whom we have every reason to be proud, and whose memory we should never cease to honor.

THE ILLUSTRATIONS.

COMPETITIVE DESIGN FOR THE LONG ISLAND HISTORICAL SOCIETY'S BUILDING, BROOKLYN, N. Y. MR. H. H. HOLLY, ARCHITECT, NEW YORK.

WE have already published several of the designs submitted in this competition, which took place some time ago, and hope to have the opportunity to publish the accepted design.

SKETCHES FOR COUNTRY HOUSES, BY MR. HOWARD WALKER.

PROPOSED MONUMENT TO JOHN C. CALHOUN, TO BE ERECTED AT CHARLESTON, S. C. MESSRS. WARE & VAN BRUNT, ARCHITECTS, BOSTON, MASS.

CONSTRUCTION OF THE CENTRAL MUSIC-HALL, CHICAGO.

See communication in another column.

ENGINEERING IMPROVEMENTS IN ROME.

THE water-shed of the Tiber is more extensive than that of the Thames. The former is estimated at 6,455 square miles, the latter at 5,163, or, including the basin of the Medway, at 6,160 square miles. The rain-fall over the Thames basin is averaged at 30 inches; that of the basin of the Tiber is stated by Venturoli as 34.8 inches, which amount is registered at Perugia. But the quantity of water which runs down the Thames is estimated, in the sixth report of the Rivers Pollution Commission, at only 6.67 inches in the year. That flowing down the Tiber is estimated by Venturoli at 27.3 inches per year. The irregularity of the discharge of the latter river, however, is something of which we have but little experience in this country. In a recent tabulation of the Italian rivers compiled by the Ministry of Public Works, while the mean flow of the Tiber is calculated at 169 metric tons per second, the minimum is 100 and the maximum 2,800 metric tons per second. The disproportion, wide as is the range, is not exceptional among Italian rivers.

Under these unusual conditions of feed and of discharge, it is not surprising that the delta of the Tiber gains rapidly on the sea. The advance made since the Christian era is measured by the obliteration of the ports of Trajan and of Claudius. According to plans collected by Sir John Rennie, the gain of the shore is about two yards per annum; but this is not so much the advance of a projecting delta as a gradual gain over a whole line of seaboard, extending over a great curve of more than 110 miles chord, stretching from Cape Farnesio to Cape d'Anzo.

It is clear that any serious effort to construct a permanent port on this shifting shore-line can only have a chance of success if it is conducted with a full knowledge of, and in due accordance with, those great operations on the course of the Tiber through Rome which have of late excited such vigorous criticisms and counter-criticisms in English and Italian journals. The plea raised by an English writer of fiction for the preservation of monuments of which it is the pride of Italy that she is the trustee for the world, is one that strikes a responsive chord in our breasts. But even a deeper note would vibrate if we could present to our readers anything of a picture of the misery and disease caused in Rome by the overflow of the Tiber. Here, as we observed before, we see the different interests which the engineer is called on to protect, in conflict. Health demands one thing; art another; commerce yet a third. How is Father Tiber to be induced to satisfy the conflicting claimants?

In 1876 a report was made to the Supreme Council of Public Works at Rome (we pause to remark on the total absence of any corresponding institution in Great Britain) by a Commission which had been nominated to inquire into the means of preventing inundations from the Tiber in the city of Rome. Nineteen plans were exhibited by the Commission, and information as to the steps which had been taken for the protection of other cities, notably Paris, Lyons, and Verona, are contained in the voluminous report. All such projects as — at the expense of twenty minutes of reflection, a sheet of paper, and a penny stamp — have been freely offered, in the columns of the daily press, as to floods and water-supply in England, were exhaustively discussed by the Commission. The chief of these were (1) the re-wooding of the banks of the river; (2) the formation of store-lakes, or basins of reserve; (3) total deviation of the course of the Tiber; (4) partial diversion of its water; (5) limitation of the flow of water allowed to enter the channel through the city; (6) rectification of the channel; (7) additions to the bridging and lateral defences of the river.

Total diversion, in the case of Rome, is impracticable. The consistency of the soil is so slight that on the construction of a new channel a powerful stream would cut its own course, and the cost of making bridges and keeping up communications would be excessive. The abandonment of the actual bed through the city would be a fertile source of malaria, even if it were filled up. Rome would have been rendered uninhabitable during the progress of the works. Water carriage would be stopped, drainage would have to be constructed, and what, the Italians further say, would Rome be without the Tiber!

A partial diversion of the Tiber was attempted by the Emperor Trajan; and Pliny recounts how the river burst the banks the emperor had made, and spread a deep flood. Some antiquaries are of opinion that the canal of Fiumicino, intended to put the port of Claudius in connection with Rome, — a precursor of the present project, — is here intended. Each plan for partial diversion and for restriction of the water allowed to come within the walls has to contend with special difficulties, on architectural, orographical, and geological grounds, — difficulties more numerous and complicated in the case of Rome than perhaps in any other spot in the world.

The Commission was thus reduced to the less heroic expedients of the clearing the channel of the Tiber within the city from the numerous existing obstacles (including the curve by the Farnese Gardens), and the walling the channel within, and embanking it without, the city, in such a manner as to contain the greatest floods. The dimensions determined were as follows: The "urban trunk of the Tiber" — that is to say, its channel through Rome — is to have a minimum width of 109 feet; the walls are to rise to the height of 55 feet, 3 inches above the zero of the Ripetta hydrometer; and the bed of the river is to have an even gradient of 1 in every 2,500, or a little over 2 feet per mile. This channel has been designed on the principle that it would be sufficient to discharge a flood equal to that which occurred in the year 1598. This was the highest rise registered in Rome, rising 8 feet higher than did the disastrous flood of 1870.

It is with the fuller information that has been gathered by the Commission on the Inundations of the Tiber before them that the Italian Ministry of Public Works will be able to form a definite judgment as to the proper steps to be adopted with reference to Rome-a-Port. Whatever information was possessed by the engineers of Claudius and of Trajan, there is no doubt that those of the present king of Italy will have enriched it with the fruit of minuter researches. There is evidence, both on the Tuscan and on the Adriatic shores of Italy, of two distinct movements which have occurred since the time of the formation of Rome, or, indeed, since that earlier time when what is now the valley of the Po was an arm of the Mediterranean. There has been a steady gain of the land on the sea, which has amounted to some 2,000 square miles in the basins of the Po, the Adige, and the Brenta, since our era; and which, on the Fiumicino shore, is going on at about the rate of two yards in the year. But together with this has occurred a series of upheavals and depressions, which, in Venetia, have even attained the depth of 143 yards; the gradual progress of which has checked or hastened the advance of the shore line at any particular epoch. The rate of depression now going on in the neighborhood of Rimini is estimated, from observations made by the engineers Lanciani and Paoli, at from 5.6 to 7.2 inches per century. It is obvious that to collect all the available information on this point is an essential preliminary to any wise outlay for the formation of a new port. Constant attention must be given to the maintenance of the depth of water. It is only by recognizing that there must be a certain amount of deposit removed every year, that a new port at Fiumicino can escape the fate of the more ancient ports of Trajan and of Claudius.

While the depression occurring on the Adriatic shore of Italy is said to be constant, though slow, we can bear personal testimony to the fact that movements are alternate on the western shore of the Peninsula. The case of the temple at Pozzuoli is well known. The alternate depression and elevation of the columns of that structure are proved by the sign of the action of boring molluscs; and, indeed, form almost the a, b, c of the geological doctrine of contemporary change. It is almost unnecessary to cite the admirable account given by Lyell, in the "Principles of Geology," of this celebrated temple, an account which has neither required nor received any alteration in the tenth edition of that work. In the earthquake of 1858, which had the chief seat of its destructive energy in Calabria and Basilicata, when many buildings were overthrown and many people perished, the entire circumference of the Bay of Naples, from Sorrento to Baiæ and Misenum, was elevated during the night from 6 inches to 8 inches above its former level, as was apparent from the line of mark of animal and vegetable life on the rocks that lined the bay. Nor did the ground thus raised subside to its former level, — certainly for six years, — or, we believe, up to the present time. We refer to this as showing how wide must be the information of the architect or engineer to whom the execution of such a project as making a port for Rome can be safely entrusted.

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Another point of view deserves a word of comment as connected with the subject we have repeately discussed, the influences of the improvement of artillery on the safety of urban sites. Rome is only 20 kilometres, or 12½ English miles, distant, as the crow flies, from the sea. The new Krupp cannon are said to have attained a range of 24 kilometres. Considering the question of the depth of water and the distance from the shore within which an ironclad carrying enormous guns may safely approach, it may be said that this is only a sort of fringe of danger, and that the more so as the Italians themselves possess some of the biggest ships, and largest and heaviest guns, in the world, as yet. Still there is a question of possibility, — mere possibility of mischief should not be allowed, when Rome is the objection. Any works of port construction in Fiumicino must also be works of efficient coast defence.

For us, and for the greater part of our readers, perhaps, the most immediately interesting part of the subject is that which relates to art. As far as we can judge from experience, art treasures of rare interest may be expected to be found in any excavations on the site of the Claudian port. At the same time the architectural, the engineering, and the sanitary portions of the enterprise are each attended with difficulty, and are thus each a subject of interest. Nor is it the least of the marvels of the day to see a repetition of the work of the Emperor Claudius proposed under the reign of Humbert of Savoy, and under the Pontificate of Leo XIII. — *The Builder.*

THE "RESTORATION" OF ST. MARK'S.

29 Queen Square, Bloomsbury, October 31.

To the Editor of the London News:

Sir, — I have just received information, on the accuracy of which I can rely, that the restoration of the west front of St. Mark's at Venice, which has long been vaguely threatened, is to be taken in hand at once. A commission is called for next month to examine its state and to determine whether it is to be pulled down immediately or to be allowed to stand till next year. The fate of such a building seems to me a subject important enough to warrant me in asking you to grant me space to make an appeal to your readers to consider what a disaster is threatened hereby to art and culture in general. Though this marvel of art and treasure of history has suffered some disgraces, chiefly in the base mosaics that have supplanted the earlier ones, it is in the main in a genuine and untouched state, and to the eye of any one not an expert in building looks safe enough from anything but malice or ignorance; but anyhow, if it be in any way unstable, it is impossible to believe that a very moderate exercise of engineering skill would not make it as sound as any building of its age can be. Whatever pretexts may be put forward, therefore, the proposal to rebuild it can only come from those that suppose that they can renew and better (by imitation) the workmanship of its details, hitherto supposed to be unrivalled; by those that think that there is nothing distinctive between the thoughts, and expression of the thoughts, of the men of the twelfth and of the nineteenth centuries; by those that prefer gilding, glitter, and blankness to the solemnity of tone and the incident that hundreds of years of wind and weather have given to the marble, always beautiful, but from the first meant to grow more beautiful by the lapse of time; in short, those only can think the "restoration" of St. Mark's possible who neither know nor care that it has now become a work of art, a monument of history, and a piece of nature. Surely I need not enlarge on the preëminence of St. Mark's in all these characters; for no one who even pretends to care about art, history, or nature would call it in question; but I will assert that, strongly as I may have seemed to express myself, my words but feebly represent the feelings of a large body of cultivated men who will feel real grief at the loss that seems imminent, — a loss which may be slurred over, but which will not be forgotten, and which will be ever deeper as cultivation spreads. That the outward aspect of the world should grow uglier day by day in spite of the aspirations of civilization, nay, partly because of its triumphs, is a grievous puzzle to some of us who are not lacking in sympathy for those aspirations and triumphs, artists and craftsmen as we are. So grievous it is that sometimes we are tempted to say, "Let them make a clean sweep of it all then; let us forget it all and muddle on as best we may, unencumbered with either history or hope!" But such despair is, we all know, a treason to the cause of civilization and the arts, and we do our best to overcome it, and to strengthen ourselves in the belief that even a small minority will at last be listened to and its reasonable opinions be accepted. In this belief I have troubled you with this letter, and I call on all those who share it to join earnestly in any attempt that may be made to save us from an irreparable loss, — a loss which only headlong rashness could make possible. Surely it can never be too late to pull down St. Mark's at Venice, the wonder of the civilized world?

I am, sir, yours obediently, William Morris.

THE "CENTRAL MUSIC-HALL."

Chicago, November 17, 1879.

To the Editor of the American Architect:

Sir, — Observing that you have noticed my letter regarding the safety of the Central Music-Hall, nearly completed in this city, and the report it called forth from the experts selected for that purpose, in which report I am convicted, but not convinced, of being wrong regarding its safety; and being anxious for ascertaining the truth, I will herewith lay the matter before you, sir, asking for elucidation on this rather perplexing topic. Hoping that the theme may be interesting to the profession at large, I shall be pleased to see it discussed more generally, for your correspondent does not seem impartial in his remarks.

Weak and faulty construction is by no means an uncommon error in this Western country, and the building named is, in my opinion, rather conspicuous for the manner in which the strains "such a building" is exposed to, the law of gravitation, and physical propensities of the materials are disregarded. After having in vain called the attention of parties connected with the building enterprise to its insecurity, although unprofessional, I concluded to ventilate the matter, as it was better for one to receive the abuse of infuriated parties, than that thousands of human beings should be exposed to injuries and death. Hence the letter which appeared in the Chicago *Times*, October 19.

The building, erected by a stock company, is a comprehensive one designed to serve all purposes, from the worship of the Deity, through the various pursuits of Mammon, to be "a worthy temple for the Muses." A difficult architectural problem to solve. The result is due to show-manager George B. Carpenter, secretary for the company, who, according to the descriptions in the daily papers, "has made it his especial business to study all the music-halls in the country from Maine to California, in order to surpass them all." This raised the expectations of architects and lovers of art considerably above the realization.

A sample construction of the building in question is illustrated in the accompanying sketch, essentially correct at the time of investigation, which shows part sections of the main hall, the position of openings leading thereto, what the same part of wall has to carry, and the manner in which the bearing has been augmented with iron columns and brick piers in the main door jambs. The iron trusses, six tons each, some eighty feet across the main hall, supported by the side walls at their ends, carry floors for art galleries above, roofs, partition-walls, and ceiling, and although exposed, as at least the one centring over the door opening is, to the extreme changes of our temperature, have no provision made for expansion and contraction; consequently subjecting this wall to an undesirable exercise back and forth.

The principles or axioms of construction and data for figuring I have used for arriving at my conclusions are as follows, viz.: That a pier or part of wall between two openings must carry the load that comes between the centres of said openings; that cohesion in mortar and the lateral pressure in ordinary brick walls are not admissible factors of strength in correct practice (for this Rothstein is my authority, and I find the same was concurred in by the committee who investigated the Rockford Court House accident); that our common brickwork will crush under a weight of 500 to 800 pounds per square inch. Rankin gives the crushing weight of ordinary good brick from 550 to 800 pounds; Barlow from 562 pounds; Encyclopedia Britannica to 490 pounds, all per square inch. The same authorities state that 112 pounds is the average per (one) cube foot of brickwork, and the safe load it can carry to one sixth of its crushing weight. We will further suppose that the minimum strain the floors, galleries, and stairs in "such a building" are *required* to sustain is 175 pounds per square foot, their own weight included, and that the incidental strain on the roof is 20 pounds per square foot.

The dimensions of the brick wall are as marked on the sketch, and the part that lies above and between the centres of the opening will, according to the above, alone amount to sixty tons; the weight and incidental strains of floors, galleries, stairs, the iron truss, with its partition, etc., that are supported by this part of the wall, amount to sixty-six tons more, or, together, one hundred and twenty-six tons, counting nothing for the proposed water-tank above the hallway. Now, for supporting this load, there was originally one foot five inches horizontal distance between the main entrance and the first gallery-door, the wall two feet and one and three fourths inches thick; but at the time the iron trusses were put in place this part of the wall showed unmistakable signs of crumbling, and then a couple of iron columns were introduced in the south door-jamb, standing on an iron plate 12 by 24 inches, laid on the brick wall at P. These columns were subsequently bricked in, and a similar pier built on the other side of the opening. This questionable operation added two square feet to the bearing area of brickwork, which thereby became about five square feet, without any allowance for joists and trimmers resting thereon. According to the above data this would safely carry only thirty tons, and if the best of materials were used, then fifty tons would be its limit.

Under these circumstances I am unable to comprehend the meaning of the experts' report concerning "proper coefficient of safety for such a building," unless in connection with the analysis of this "weak spot" of the building and the strength of the report we also examine the experts and the object they had to serve. Architects will notice the scarcity of the profession represented in the examining committee, and, with due respect for the gentlemen constituting it, I cannot refrain from observing that the chairman, ex-mayor, president for a dock company, etc., is said to be a "rusty expert" on the subject. Mr. Chesbrough is ex-city engineer, and, judging from the manner in which some of our public works have

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been planned by him, his abilities have been somewhat over-estimated. I have criticised the abominable way in which he mixes Chicago sewage in its water-supply rather harshly, and I suppose he, in return, enjoyed the opportunity of attesting to a report not very favorable to my reputation. The other two gentlemen, and, perhaps, the only ones who know anything about architecture, had, you will notice in the report, examined the plans for this building before work thereon commenced, and approved of the same, particularly as to strength. Is it likely that they would go back on their previous report? That they did err in the first one seems evident from the fact that iron columns and brick piers had to be inserted in the door-jamb in question in order to keep it up. I will excuse these "architectural experts" for not being able to see cracks in a wall that had been plastered, but they ought to have noticed the fact that it had been patched and added to. My criticism, perhaps rash and emphatic, was done in order to avoid a calamity, which, at one time or another, seemed to be the inevitable result of such construction, and I am not alone in this opinion. Had similar questions been raised regarding the safety of Rockford Court-House, Adrian grand stand, and others of the same category, those horrible catastrophes might have been prevented. The philosophy and data whereby the experts came to the conclusions expressed in the report would be of great interest and, perhaps, of great value to the architectural profession. Very respectfully,

L. G. HALLBERG.

AN ARCHITECT AND HIS SUB-CONTRACTOR.

ST. LOUIS, November, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — In No. 202 of your journal, published November 8, you were kind enough to insert my letter and also to express your opinion of the case. That you misunderstood me, and the reason why, were evident to me on re-perusing my letter. As the person who I understand is the correspondent of your paper in our city has an office directly opposite the building where the signs mentioned were exhibited, I waited some time before writing to you. Finally becoming convinced that he had either not noticed it, or intended to take no notice of it, I considered it my duty as a member of a profession which is, I am sorry to say, not regarded with too much confidence by the public, to notify them that such proceedings were not indorsed by the profession.

I shall now endeavor to give you a more clear account of the case. The building is one of the most conspicuous in the city and will be occupied by one of our principal retail dry-goods firms, located on one of our most crowded thoroughfares, where the better class of our business community pass daily to and fro. On account of its immense size as well as the prominence of the firm who intend to occupy it, public attention was naturally directed to the building.

The signs were large ones, plainly lettered and hung in such a manner as to attract the attention of any one passing that way.

As they hung there for nearly two weeks, it is hardly fair to suppose that the architects were unaware of their presence, the building being but two blocks from their office and visible from their windows.

In such conduct the reason may perhaps be sought why the American Institute has no Chapter in as large a city as ours, the party referred to being a member of that body.

Respectfully yours, JUNIOR.

THE WALLS OF TANAGRA.

November 23, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — I solicit once more your indulgence for the insertion of my excuses, and the rectification called out by your candid correspondent.

As no reference to the "battle of Tanagra" (which certainly occurred in 457 B. C.) is contained in the passage of Notes on Tanagra Figurines, page 13, where is noticed an erratum of one numeral in the date of the razing of the city walls, I confined my attention to the chronology proposed by your correspondent, for the battle with which he seemed so well acquainted. Distinct from this was an engagement casually mentioned as giving the epoch at which the fortifications of Tanagra were demolished.

For 426 B. C. read 456 B. C.; see Curtius, book iii., chap. ii.; Leake, Northern Greece, vol. ii. M. F. C.

PRIVATE SEWERAGE IN BALTIMORE.

BALTIMORE, MD.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Gentlemen, — In a house which I have just finished for a gentleman of this city I have, I believe, about as perfect a system of drainage as can be devised, — the product, jointly, of the owner's suggestions, the builder's experience, and my own thought.

The problem to be solved was not an easy one. Given, a lot, sloping up considerably towards the rear; a basement kitchen, considered an essential by the ladies of the family for successful housekeeping, and for gaining additional light into the dining-room above; and the preference for a servants' latrine at the extreme end of the yard; to find the most perfect means of carrying off the water, soil, etc., and in a way that would be likely to cause no trouble in the future. The kitchen being in the basement, and the ground high behind, had of necessity to have an area, and a sloping grass bank, with steps on one side for reaching the yard, which runs fifty feet back to an alley, and is accessible also by a sort of bridge from the dining-room window. This area, four feet wide, and inclosed by a retaining wall, extends along the side of the entire back building, forming a sort of alley from the main house, with an entrance at grade to the cellar.

The first move that we made was to dig a well at the extreme end of the lot, over which was placed the servant's closet; but the soil-pipes from the house could not be carried into this on account of the great expense of digging, and because the mouths of the pipes would have been too low down in the well. We therefore dug another well in the rear area, which can easily be got at, and covered it over with heavy flags, cementing well all joints and paving over the top. Both these wells were dug to a good head of running water. In the second one we struck a spring which, emptying more rapidly than the soil could drain the water off, threatened at one time to give us trouble, but eventually the tide went down, after reaching within eighteen inches of the cellar level. In the corner of the wall, near this well, was left a four by eight inch opening clear to the top of the house, and connected with the well, so that any gases on the surface would be taken off, and not enter the house-pipes. The rear well had a wooden ventilation tube out through the roof of the servants' closet. Into the area well drains all the soil from the water-closets, but nothing else.

We were well aware that soapy water will eventually choke up a well by lining the sides with grease and slime, — and on no account should such water be allowed to empty into it. What then were we to do with soap-water from the basins, tubs, laundry, pantry-sink, etc., the waste from the slop-hoppers, and the rain-water from the roofs of back and main buildings, — the latter, with exception of a small mansard, throwing all its water to the rear, — together with the water that would collect in the area?

Baltimore is very badly provided with sewers. The numerous hills on which it is built provide surface drainage to such an extent that none are absolutely necessary but those at the bottoms of the slopes, which receive the contents of numerous gutters, by means of open culverts. By this arrangement the streets are thoroughly washed by rains, and the residents are able to dispose of their drain-water with very little trouble. But we were some distance under ground, and had all this torrent of water of every sort to dispose of. Fortunately for us, running along one of the cross streets, at two or three hundred yards distance, is a private sewer that some gentlemen had laid to drain the basements of their houses in the block above. This sewer consisted of a ten-inch pipe, connecting with a city sewer at about four blocks distance. Into this we ran an eight-inch cement pipe from the front of the house, and from thence to the rear laid an iron pipe under the cellar pavement. It is trapped in the cellar to prevent freezing, and at its opening in the yard has a grating to prevent any solid matter from finding its way into it. This sewer disposes of all the before-mentioned water, the rain-water flushing it out at frequent intervals.

From the area well we laid a small drain, opening about two feet below the top, to prevent any overflow should the water ever rise again, as it might do in the spring. This drain connected direct with the main drain.

All the pipes from pantries, baths, etc., empty into the open area gutter, thus preventing any odor from the sewer finding its way into the house.

The soil-pipes of the water-closets are carried up all the way to the roof, as usual, and capped with ventilators; besides which we have a ventilation pipe from the trap of each closet to a smoke-flue just back.

I believe all the arrangements I have mentioned are very complete; and thinking a description of them may be of some use — or if not of use at least of interest — to your readers, I send it to you. Yours, gentlemen, T. BUCKLER GHEQUIERE.

[We cannot agree with our correspondent as to the perfection of his method of drainage, and shall look to see some of our expert contributors take him to task for infecting the soil, if not the air, of his city. — EDS.]

THE STÈLE OF LYSIAS AT ATHENS. — It has lately been discovered that the well-known Stèle of Lysias, at Athens, which has ever since its discovery been of great interest because of the form of the letters upon it, these being supposed to date from the sixth century B. C., has another claim upon those interested in Grecian art. Thanks to a judicious cleansing, says the *Portfolio*, a full-length portrait of Lysias, painted on the white marble with much delicacy of drawing, has been revealed. The color is a reddish brown, with accessories in a bluish black. On the plinth of the stèle is painted a youth riding a race-horse. These paintings have been published in the original colors by the German Institute at Athens. Lysias stands in profile, with the pointed beard and the severe expression characteristic of Greek art in the sixth century B. C. He wears a long mantle reaching to the feet, and holds in one hand the drinking cup of Dionysos; in the other hand he holds a branch; and from these two emblems it is concluded that he is here represented in the capacity of a priest of Dionysos. It is thought now that others of the Athenian tombstones, hitherto supposed to be plain, will, if cleansed, turn out to have been painted with a memorial design.

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NOTES AND CLIPPINGS.

The New York Building Department and the Cannon Street Fire. — One of the causes which operate to nullify the best endeavors of the New York Department of Building in reforming defects and abuses in existing buildings is explained by the *Commercial Advertiser* as follows: It is necessary to find out every one interested in the construction and alteration of a building, including mortgagees, etc., in order to serve notices of irregularities upon each of them, and a failure to serve one may, and often does, invalidate a suit at law. The inspectors will sometimes find that some violation of law has taken place on a piece of property, and ascertain who are the owners, etc. Before notices can be served, after the case has been reported, the property has often been transferred, without the transfer being recorded, to avoid responsibility, and nearly all of the labor has been thrown away, requiring the work to be done almost *de novo*, only to meet, perhaps, with another obstruction of a further transfer of the property. At times, also, when certain provisions have been ordered by the Department of Buildings, and they have been carried out under the supervision of the Inspectors, some subsequent owner will change the plan without notice to the department. This was particularly noticeable in the case of the fire at No. 80 Cannon Street, where a fire-escape and scuttle were ordered, and where both were completed according to the inspector's report, the scuttle being provided with a ladder. And yet fireman Lynch was badly burned in the vain attempt to find a scuttle, which must have been closed up and the ladder removed by a subsequent owner of the building, as the property had evidently changed hands.

Industrial School. — As a fitting sequel to Dr. Robert Grimshaw's address at the Spring Garden Institute, Philadelphia, Tuesday evening, November 11, the Board of Managers of that institution has decided upon establishing a school of mechanical handiwork, similar to the one in Moscow, where young men may be taught practical mechanics by competent instructors and in a regular system calculated to produce finished workmen.

Figures of Sesostris. — Mr. F. W. Furnival, writing to the London *Athenæum* from Smyrna, says: "I shall be glad if you will allow me to inform archæologists in England of a very important discovery which has been made in this neighborhood. It will be remembered that in his second book Herodotus speaks of two figures of Sesostris carved on rocks in Asia Minor. One of these is well known, and is commonly called the Pseudo-Sesostris. It is sculptured in low relief on a rock in the pass of Carabel, near Nymphi, and represents a man with a conical head-dress and boots turned up at the toes, holding in his right hand a bow, and in his left a spear. Herodotus, so far as I remember, describes one of the two figures, and speaks of it as having the spear in the right hand and the bow in the left; he also states that there was an inscription in sacred Egyptian characters running across the breast, whereas the only characters on the Pseudo-Sesostris are near the head of the spear. Hence it has generally been supposed that the historian's account is inaccurate; but I am now able to inform your readers that the second figure has been discovered, and that it exactly answers to his description. It was found about eighteen months ago by Mr. Spiegenthal, the Swedish Vice-Consul at Smyrna, who kindly furnished me with particulars which enabled me to see it last week. It is sculptured on a piece of rock near the entrance to the pass of Carabel, and at a short distance from the Pseudo-Sesostris, to which it bears a general resemblance; but there are several reasons which lead me to believe that it is the figure which Herodotus describes. In the first place, the spear is held in the right hand and the bow in the left, as he distinctly asserts; and, moreover, there are traces of a belt running across the breast on which characters may have been inscribed, while there are no signs of them near the head of the spear. Again, it is probable that Herodotus would describe the second figure if he visited the spot, as the old road, which can be clearly traced, passed close by it, while the first figure, by which I mean the Pseudo-Sesostris, stands about 120 feet above it, and could not be seen so easily. Owing to its position near the road, the second figure has not been so well preserved as the first, and no characters of any kind can be distinguished; but those on the first figure are still legible, and Professor Sayce, who accompanied me, considers them to be Hittite. The road through the pass of Carabel now runs at the back of the rock on which the second figure is sculptured, and on this account it has not been seen by former travellers. I may add that when we visited the statue of Niobe, on Mount Sipylus, we heard of a rock-cut figure near it, representing some kind of animal, and apparently of a very archaic character. Unfortunately we were unable to find it; but we discovered ancient remains of various kinds, including several rock-tombs; and the fact that these and the second figure of Sesostris have been so long unknown shows clearly enough how much is left for archæologists to do in this part of Asia Minor."

Jannin's Cement. — A plastic cement is a recently patented French product, which is called, after its inventor, "Jannin's Cement." It is simply composed of a mixture, in suitable proportions, of yellow oxide of lead — that known in trade as "Massicot" is preferred — and glycerine; other metallic oxides and coloring matters may be added to the above mixture, according to the character or color that may be desired. The cement may be made to possess more or less stiffness by varying the proportions of glycerine; the larger the percentage of the latter, the softer the cement, and *vice versa*. This cement is represented to be especially adapted for moulding objects which demand an extreme delicacy in the lines of the cast, such as engraved blocks and plates, forms of printing type, photoglyptic plates, etc. It is affirmed that it sets in a few minutes under the influence of a gentle heat, and then admirably resists heat and pressure. When set it is said to make a good substitute for lithographic stone. It is also recommended for artistic reproductions, such as fac-similes of terra-cotta, the color and sonorousness of which it closely imitates. It does not shrink in setting. — *English Mechanic.*

A Horse's Box-Stall. — A box-stall costing $13,000 has just been finished in the stable of Baron Rothschild, of Vienna, for his favorite horse. The stable proper has marble floors and tiles painted by distinguished artists, rings, chains, and drain traps of silver, and the walls are frescoed with hunting scenes. The building cost $80,000.

Ceramic Art and the Cherokees. — A curious fact, in view of the rivalry now existing between England and America, and one unknown to most potters, is that in 1632, about the time when the first china-ware was made in England, the principal clay used in the manufacture was obtained from America, being purchased from the Cherokee Indians of the Carolinas, and was called by them "unaker." This material was used for thirty years, and only abandoned because of the great expense of transportation. At that time great fears were entertained in England lest America should be able to flood the world with a superior china, but the discovery of china clay-beds at Cornwall arrested the impending danger. To-day, however, the ceramic art, as developed at Trenton, N. J., promises to cope successfully with the best goods at Staffordshire, England. — *Commercial Advertiser.*

Metallic Roofing. — Apropos of new uses for iron, which are now being looked out for, as it would seem, with but insufficient zeal, we may mention that systems of metallic roofing have have been for a considerable period in vogue in more than one Continental state. The Montaire Company in France have a patent system of metallic tile and tile fastening, which promises well from the description, and has given, we believe, satisfactory results in practice. A firm in the Harz, at Rübeland, is now making metallic tiles, not like the Montaire tile, of corrugated plate, but of charcoal pig-iron. This firm is said to have been induced to take up the manufacture by noticing that a cast-iron roofing over one of its shops had stood for fifty years without undergoing deterioration. It was also found, at the time when inquiries were made about this, that a neighboring castle which was the seat of the Dukes of Brunswick, had received a metallic roofing in 1830, and this roofing was still absolutely sound and weather-tight. The Rübeland Company state that as against common tiles the metallic substitute is lighter in the proportion of 35 to 60. A square metre can be covered for 4*s.* 6*d.* — *Iron.*

Mechanical Plastering of Walls. — A machine for plastering walls has been invented, which consists of a receptacle for the mortar, the segment of a cylinder in form. It is provided with a hinged plate that presses against the mortar, and, as the receptacle is moved upward against the wall, presses the plaster out through a narrow-gauged opening at the bottom.

Can a Steam Pipe set fire to Wood? — At the Crescent Steel Works in this city a steam pipe 2½ inches in diameter, carrying from 90 to 100 pounds pressure, was laid under ground about three years ago, encased in common pine boards about one inch thick. A few days since occasion was had to dig up the pipe, and the whole length of the wooden drain was found to be charred and apparently burnt, about three fourths of the thickness of the wood, the other fourth being partially rotted. The whole inside of the drain was turned to charcoal, with here and there spots of white ashes, showing that ignition had actually taken place. It seems probable that if the casing had not been excluded from the air by the earth covering it, it would have blazed and been entirely consumed. It is generally believed that a steam pipe cannot set fire to wood, but this case seems to prove the contrary, and it may explain the origin of many mysterious fires. — *American Manufacturer.*

Sand-Paper. — There is such a scarcity of No. 1½ sand-paper, such as the finishers of soft wood use, that the manufacturers of it are now fully three months behind their orders. The trouble arises from the fact that the machines that crush the quartz run their products either too coarse or too fine, and the exact size of grit for the 1½ paper is obtained only through the medium of a great waste of labor and quartz.

Anecdote of Méryon. — Mr. Seymour Haden, in his new work on etching, tells an odd story of Méryon, that eccentric and insane genius. He went to visit Méryon and found him in a clean but plain little room, high up on Montmartre. He was at work and did not resent Haden's visit; "but with a courtesy quite natural, offered me, and apologized for, the single chair, and at once began to discuss the resources and charms of etching. He was also good enough to allow me to take away with me a few impressions of his work, for which, while his back was turned, I was scrupulous to leave upon the table what I was sure was more than the dealers would have given for them; and so we parted, the best of friends. But what followed showed how, even then, his mind was unhinged. I had walked fully two miles in the direction of Paris, and was entering a shop in the Rue de Richelieu, when I became aware that Méryon, much agitated, was following me. He said he must have back the proofs I had bought of him; that they were of a nature to compromise him, and that from what he knew of 'the etched work which I called my own,' he was determined I should not take them to England with me! I of course gave them back to him, and he went his way; and it was not till after his death that I became aware that about this time he had written to the editor of the *Gazette des Beaux-Arts* to caution him against being taken in by me, and to impart to him the conviction that the plates which I pretended to have done were not done by me at all, or even in this century; but that, doubtless, I had discovered and bought them, and signed and adopted them as my own."

A Queer House. — An eccentric Englishman has recently built a house in the Tivoli Quarter for the residence of himself, his wife, and eight children, which is the talk of all Paris. It is circular, and has neither door nor window externally. The approach to it is from the ground floor to the roof by means of a ladder, which is moved up and down by machinery similar to that of a drawbridge. There is only one floor, and that contains eighteen apartments, more or less small in dimension, looking into the centre, which is lighted from above by a glazed cupola. One stove for all these rooms is in the middle, and in summer its place is to be occupied by an exquisite parterre of flowers. A circular balcony, open to all the apartments, surrounds the space. The motive of this oddity is, of course, only known to the author of it, but everybody can see that two points are gained by it, — immunity from the taxes on doors and windows, and a perfect preventive of any attempt at burglary.

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A RUMOR comes from Washington that the (joint?) Committee on Public Buildings and Grounds has taken advantage of the recess of Congress to inform itself thoroughly of the condition and needs of the various public buildings now going up in the United States at the expense of the general Government, and means at the next session to propose some legislation which shall ensure that the work on the government buildings shall be carried on after some general system, with direct and exclusive regard to the wants of the Government rather than to the distribution of the public money or the demands of constituencies. The committee could not do the country or the Government a better service. How they are to accomplish this is not suggested, nor is it very easy to divine, though the abuses at which they should aim, and the source of them, are visible enough. The vice of the present procedure is in the manner of fixing the appropriations, — of distributing them, we may say; for it is exactly a case of distribution among claimants. In the first place, the buildings are undertaken not solely with a single eye as to what the public service requires, but more, like the river and harbor improvements, with a view to what Congress can be persuaded to "do for" this or that city. The sum of money appropriated in any one year is proportioned not to the actual needs of the work that is in hand, but to the amount which it is supposed Congress will be willing to assign to the construction account, or to what it is thought the country ought ordinarily to spend in building. The special appropriations are assigned much less according to the wants of the buildings under construction than to the importance of the constituencies for which they were undertaken, or to a simple geographical distribution, or to the influence and clamor of local delegations.

THE natural results are that the buildings are not undertaken in the order of their real importance, nor proportioned in their scale to their real uses so much as to the amount of money which Congress can be persuaded by the different members to assign to their towns; that more buildings are undertaken at once than the country can afford, or than Congress will consent to do justice to in the annual appropriations; and often that the Supervising Architect's office is flooded with more work than can with advantage be attended to in it. The appropriations are doled out annually with reference to giving each building its portion year by year, not to the constructive needs of the individual works. If an individual appropriation looks large to the average congressional eye, it is challenged, and probably cut down, without reference to the particular condition of the work for which it is asked. The sums yearly appropriated for important buildings are seldom large enough to keep the work on them going continuously and rapidly; so that it either languishes, or is interrupted altogether for want of supplies. The bad economy of this procedure is clear. Any thrifty contractor could tell the Government that the way to do large work economically is to put men and money enough on it to carry it through briskly and without interruption, and to undertake no more at once than can be pressed on energetically; that nothing is so costly as to let work drag, or to keep interrupting and resuming it. As a matter of fact, the dribbling distribution of money which is our habit keeps a score or so of buildings hanging on together unfinished year after year, the Government being unable to use any of them, when by concentrating effort on them they might be all finished in equal time, and many of them successively occupied while the others were finishing. Worse than this, the appropriation often gives out before the year ends, and many costly works lie untouched for half the time. So the work drags on endlessly, the buildings deteriorate rapidly during their interruptions, and much of each year's pittance is consumed in preparations for resuming work which should not have been interrupted, or in restoring that which has begun to go to ruin because it has been left half done.

HOW the present system works can easily be seen by anybody who notices the lingering births of most of our post-offices and custom-houses, the utter want of relation between the limits of expenditure fixed for them beforehand, and their actual cost; or who will consult the reports of the Supervising Architect for two or three successive years, and see by the history of particular buildings how the works are again and again interrupted for lack of the necessary provision from Congress, how the reiterated warnings of this officer that without more sufficient appropriations important works must come to wasteful stoppage are disregarded and verified. The root of the difficulty, of course, is in the facts that Congress, which votes the appropriations, is uninformed on the subject to which they refer, and that in voting them it is moved as much by the exigencies of politics as by the real use of the appropriations. It is, as we said, difficult to divine what legislation can cure these evils, which are, briefly, want of knowledge of the subject, and want of interest, and — not to put too fine a point upon it — want of conscience. Information is accessible to Congress if Congress will take time to acquire it, or will put confidence in those who have it to offer. But if the present Committee on Public Buildings and Grounds makes it a business to learn thoroughly the real needs of the building department and to give advice accordingly, there is no security that Congress will listen to their advice, or that the next committee will follow in their footsteps. The responsible officer, to whom it is natural to look for actual knowledge and good judgment of what should be done for the public buildings, is the Supervising Architect. But even if means were devised by which his voice could make itself felt in the Capitol, it is not likely that in a matter which concerned the distribution of the public moneys he could make it influential in a Congress, as Congresses go, unless he were an efficient politician. If he were an efficient politician, it is almost sure that he would not be a first-rate architect, and then, — good-by to our hope of a satisfactory public architecture. As for the actual conduct of the work that is now in hand, there seem to be two ways of doing better than we do now. One way is to adopt some such plan as that brought forward in the last Congress by the late Mr. Schleicher, of Texas, but crowded out by political business without even getting a hearing, — of setting apart at once a sufficient sum to complete all the buildings that are now in progress, then to finish them without interruption, and with all reasonable speed. This would do away with a good deal of waste, and save much mischievous delay, but it might bring some other difficulties with it; and, at any rate, now that we have lost Mr. Schleicher, there is no likelihood that another will come forward to carry through his project. The other way is, given the amount of money that can be appropriated to the building account, to divide it among such buildings as need it most, because of either their importance or their condition, in such quantities as will allow them to be pushed forward to the best advantage, and let the others wait their turn. If the committee can bring Congress to something like this, they will deserve well of the country, however they may succeed in pleasing individual members or satisfying local demands.

THE President, in his message last Monday, called attention to the Washington Monument, reminding Congress that "the strengthening of the foundation has so far progressed as to insure the entire success of this part of the work," and recommending "that such further appropriation may be made for the

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continued prosecution of the work as may be necessary for the completion of this national monument at an early day." All of our countrymen who honor the memory of Washington would be glad to see the monument completed, if it could be completed in a form worthy of its object; and no doubt most of those who could would be willing to give their contributions to that end, if they could take any interest in its design. As it is, that part of our countrymen which takes the matter as it comes, without inquiring into the suitableness of the present design, is perfectly apathetic about it, while it is safe to say that the part which has an intelligent interest in the question of its form is substantially agreed in desiring to be delivered from ever seeing finished the mutilated fragment, which it is now proposed to execute, of a design which, even in its complete form, was unworthy. We can but think that the President is moved to his appeal rather by sympathy with the purpose of the monument than by preference for its proposed form; and with his hearty endeavor to forward the work considerate people will sympathize. But Congress, which assumes to represent the desires of its constituents, should give little support to a project which the people at large look upon with entire indifference, while those who are best qualified to judge of it regard it as a reproach. Can nothing be done to persuade those who have this matter in charge, and those who are expected to vote the money for it, to find out whether the people whose money it is proposed to expend really want the present design carried out, and whether those people who care something and know something about the thing as a matter of art consider it creditable?

The last few days have been appallingly full of disasters from fires and in buildings. We have the burning of the Opera House in Toronto, Canada, in which the janitor and his family were burned. Then we have a panic in a St. Louis schoolhouse, where a slight fire sent the girls in the upper stories down in such frightened confusion that the railing of the stairs was broken and several of the children were injured, as well as one of the teachers. There was also a panic in a church in Waynesboro, from the breaking down of a bench, coupled with an alarm of fire. The gallery-railing was broken by the pressure of the crowd, and a mass of persons fell over into the mass below. Fifteen or twenty persons were injured. An explosion and consequent fire in the New York Electrotype Foundry, probably from fumes of benzine set on fire by gas, killed two men. The burning of the horse railroad stable in New York, costing the lives of two firemen and a hundred times as many horses, was a horror of its own kind. Here was a stable, two hundred feet by six hundred, with horses stalled in the second, third, and fourth stories, and a great part of the same stories filled with hay, straw, and fodder. The fire ran through it very quickly, and the hostlers who ventured in to save the horses had to retreat before they could take care of them, leaving two hundred or more to be burned, while the two firemen were killed by the falling walls. It is a strange thing that with such examples continually before them the mass of our people continue to build and plan as recklessly as ever. Considerate owners are gradually improving their methods; architects, and even underwriters, are studying means of security; building laws in our large cities force upon the people, much against the grain, certain small measures of safety; but where the ordinary speculative builder or thrifty owner is left to his own ways, these ways are as bad as ever. We still build theatres and halls which are tinder-boxes and traps; churches where crowded audiences are sent up-stairs, to make room for Sunday-school rooms and parlors and kitchens beneath, and are poured downstairs together in a huddle to a single exit; factories five or six stories high, full of combustibles or explosives, with a single wooden staircase, and perhaps an open hoistway; stables covering acres of ground, in which great hills of hay are stored in a single mass; school-houses which are like honeycombs full of larvæ. Into some school-houses in New York, we are told, eighteen hundred or two thousand scholars are crowded, swarming like bees in a hive, high above the ground. Certainly there is work to do to get the better of all these abuses. In the matter of good city stables one desirable precaution would seem to be to insist at least upon the subdivision by brick walls of the space used for storage of combustible fodder, and upon flooring it with brick at the bottom when it did not reach the ground, which it never does. A check should also be put upon the stalling of horses above the second floor. A bill which was introduced into the legislature of New York last winter for the protection of animals, and which prohibited keeping them in any injurious or unsafe quarters, might have had some influence in lessening the dangers to horses in city stables if it had not failed to pass, though the limits of safety might have been difficult to construe; but the horses inside are not all that is endangered, and restriction is needed for the sake of the community as well as the animals.

The will of the late Duke of Brunswick, which attracted so much notice at the time of his death, two or three years ago, and by which he left his whole fortune, amounting to a hundred millions of francs or so, to the city of Geneva, where he had lived out his last years, contained a condition that Geneva should build a handsome mausoleum to his memory. This the city has done with great splendor, and the mausoleum, or monument, in the Place des Alpes, was finished only a month or two ago, at a cost of some three hundred thousand dollars. According to a description of it in the New York *World*, it is modelled upon the famous Scaliger tombs at Verona. It is a hexagonal canopy of Carrara marble, standing on a platform of red granite, and covering a sarcophagus surrounded by an iron *grille*, the sarcophagus being sculptured in relief with scenes in the history of the house of Brunswick. About it stand six ancestral statues in white marble, and the platform, girt with a balustrade of red granite, is beset with sphinxes, and lions of the same material guard the steps to it. It is covered by a gabled *flèche* or pyramid of red marble, a white marble angel standing in a niche on each of the six faces. This is crowned by a pedestal of white marble, on which is a bronze statue of the duke on horseback, the whole being sixty feet high. The city has also expended one out of the twenty millions of dollars in its legacy in building an opera house, of which M. Garnier, we believe, is the architect. It is built in the manner of the Grand Opera House at Paris, and is behind only that and its rival at Vienna in magnificence. The Canton of Geneva naturally wished to share in this good luck, but the city refused to divide its inheritance, and so, although it has been a custom to remit the cantonal tax of two and one half per cent on legacies left for public uses, the Canton insisted this time on its right to the duty, and the city has had to pay two millions and a half of francs for the privilege of using the remainder. The opera house was to have been opened this season, and was finished a month ago, it is said. Now that all this is done, that the money is spent on the opera house and the mausoleum, and the succession tax is paid, the city is told that the duke's heirs have succeeded in breaking the will, on the ground that the duke, having been interdicted from reigning, and proclaimed by the courts a spendthrift incapable of managing his property, was disqualified from disposing of it by will. Therefore the will is declared void by the tribunal of Brunswick, and the estate may be expected to revert to the duke's natural heirs. The city of Geneva, however, is wealthy as well as thrifty. She has got her opera house, and undoubtedly is able to pay for it, little as she may like to. The succession tax may yet be recovered, and she has at least the satisfaction, such as it is, which not all cities can claim, of having done handsomely in her memorial by a man who tried to do handsomely by her.

A correspondent, whose letter we print in another column, complains reasonably that a drawing of a building which he furnished as an illustration for our paper has been copied without acknowledgment and without his permission, and circulated among the building trades on an advertising card issued by a manufacturing firm. He appeals to us to know whether the copyright of this journal is not a protection against piracy to those who contribute to our illustrations. The question has not been brought forward before: now that it is presented we are glad to take an opportunity of giving our testimony as publicly as possible. We do not doubt that the firm which has copied this design has done so without reflection and without realizing that to do this is to violate the rights of the owner and to infringe upon our copyright; and we presume that upon our representation of the rights of the case the card will no longer be circulated, unless by permission of the author of the design. Our copyright bars the unauthorized reproduction of any of the designs which are published for the first time in these pages. Our rights in this respect may be enforced in the courts; their maintenance is a due protection to architects who entrust their designs to us for a specific use, and do not expect to see them appropriated by other persons without payment and even with-

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SANITARY SUGGESTIONS.[1]

THE health of any building is dependent upon free and moving pure air, outside and inside its walls; anything which interferes with this first condition of health is injurious. And it follows that in towns, where land is dear, and a large number of persons are crowded on a given area, better ventilation and circulation of air may be obtained by placing dwellings in stories, one above the other, and leaving spaces between the buildings, than by placing them in one-storied buildings, which would be too close together to allow of circulation of air round the building.

The next step in knowledge of sanitary construction is to learn how to obtain pure air in a building. What is pure air? What are the impurities which make the air of a town so different from the fresh air of the country? The volume of sulphuric acid from coal thrown up by our fires into London air is enormous. A cubic yard of London air has been found to contain 19 grains of sulphurous acid. The street dust and mud are full of ammonia from horse-dung. The gases from the sewers pour into the town air.

Our civilization compels us to live in houses, and to maintain a temperature different from that out-of-doors. What are the conditions as to change under which we exist out-of-doors? The movement of the air is stated in the Registrar-General's reports to be about 12 miles an hour on an average, or rather more than 17 feet per second. It will rarely be much below 6 feet per second. Imagine a frame of about the height and width of a human body, measuring about 6 feet by 1½, or nine square feet. Multiplying this by the velocity of movement of the air at 6 feet a second, it will appear that in one second 54 cubic feet, in one minute 3,240 cubic feet, in one hour 196,400 cubic feet of air would flow over one person in the open.

In a room the conditions are very different. In barracks, in a temperate climate, 600 cubic feet is the space allotted by regulation to each soldier; and when in hospital from 1,000 to 2,500 cubic feet to each patient. If it were desired to supply in a room a volume of fresh air comparable with that supplied out-of-doors, it would be necessary to change the air of the room from once to five times in every minute, but this would be a practical impossibility; and, even if it were possible, would entail conditions very disagreeable to the occupants.

Hence, to maintain the comfort and temperature we desire indoors, we sacrifice purity of air. Therefore, however impure the outer air is, that of our houses is less pure; and it may be accepted as an axiom that by the best ventilating arrangements we can only get air of a certain standard of impurity, and that any ventilating arrangements are only makeshifts to assist in remedying the evils to which we are exposed from the necessity of obtaining an atmosphere in our houses different in temperature from that of the outer air.

On the other hand, why should we not do our best to obtain as pure air as we can? It has been recently shown that the soot and many deleterious matters from smoke may be easily removed by passing the smoke through spray on its way to the chimney. This would remove much impurity from town air; but until such a system of purifying town air is adopted, we can improve the air in our houses by removing the suspended matter from the inflowing air by filtration. Moreover, these suspended matters exist in much smaller quantities at an altitude: at 100 feet they are greatly diminished, at 300 feet the air is comparatively pure. In Paris the air for the Legislative Assembly is drawn down from a height of 180 feet, so as to be taken from a point above many of the impurities of the town atmosphere. That is a reasonable and sensible arrangement, and might be usefully adopted in public buildings in towns. In the Houses of Parliament, the so-called fresh air is taken from courtyards on the street level, from which horse traffic is not excluded.

The maintenance of the standard of purity, or rather impurity, in a building, depends on ventilating arrangements. Ventilation chiefly depends on the laws which govern the movement of air, its dilatation by heat or contraction by cold; or, if ventilation is effected by pumps and fans, then upon the laws of the motion of air in channels, the friction they entail, and similar questions. Therefore all these are matters for careful study. But when we apply the study to practice, other considerations occur. We are told by theory that a room containing an air space of 1,000 cubic feet, occupied by one individual, would require to be supplied with 3,000 cubic feet per hour in order to maintain it in a proper condition of purity and humidity. But in our temperate climate, a careful practical examination of the condition of barrack-rooms and hospitals, judged of by the test of smell, showed that the arrangements which appear to provide for a volume of air much less in amount than that obtained by calculation will keep the room in a fair condition. These results have pointed to about 1,200 cubic feet of air admitted per man per hour in barrack-rooms occupied by persons in health. This need not be set down to errors in calculation or in theory.

There are many data which cannot be brought into the theoretical calculation. For instance, the carbonic acid disappears in a newly plastered or lime-washed room, and could be recovered from the lime; therefore a newly cleaned, lime-whited room will present different conditions from a long-occupied, dirty room. Washing with quicklime destroys fungi in dirty walls; the same effect is produced by sulphurous acid fumigation. Air has the same property, especially dry air; and hence, opening windows, turning down beds, and all such measures, act directly on the subsequent state of the air. Therefore an enormous effect is produced on all the elements of the above calculation if the windows of a room are kept open for several hours a day instead of being closed. Besides this, the conditions under which the air flows in and out of a room are so varied. The walls and ceiling themselves allow of a considerable passage of air. The ceiling affords a ready instance of porosity. An old ceiling, it will be observed, is blackened where the plaster has nothing over it to check the passage of air, whilst under the joists, where the air has not passed so freely, it is less black. On breaking the plaster it will be found that its blackness has arisen from its having acted like a filter, and retained the smoky particles, while the air passed through. Ill-fitting doors and windows allow of the passage of a considerable quantity of air. In a temperate climate, where the changes of temperature of the outer air are rapid and considerable, these means of producing the outflow from and the inflow of air into a confined space are in constant operation. A sleeping-room is very warm when occupied at night, a rapid fall of temperature outside occurs, and at once a considerable movement of air takes place.

It may be summed up that, whatever the cubic space, the air in a confined space occupied by living beings may be assumed to attain a permanent degree of purity, or rather impurity, theoretically dependent upon the rate at which emanations are given out by the breathing and other exhalations of the occupants, and upon the rate at which fresh air is admitted, and that therefore the same supply of air will equally well ventilate any space, but the larger the cubic space, the longer it will be before the air in it attains its permanent condition of impurity. Moreover, the larger the cubic space the more easily will the supply of fresh air be brought in without altering the temperature, and without causing injurious drafts. One of the chief difficulties of ventilation arises from the drafts occasioned thereby. Every one approves of ventilation in theory, but practically no one likes to perceive any movement of air.

These conditions point to the care which should be exercised in the form of rooms, the positions of windows, doors, fireplaces, and other matters. We should study how the currents of air move in a room; what is the effect of the form of the room on the circulation of these currents of air. For instance, a lofty room with the tops of windows some distance below the ceiling, and without outlets for air at the ceiling level, becomes dangerous unless a constant circulation of air goes on, because the heated air, loaded with impurities, ascends, stagnates in the space near the ceiling, cools, and falls down, and remixes with the air in the lower part of the room, and thus increases its impurity.

These effects are modified by anything which causes circulation of the air. The open fireplace creates circulation of air in a room, with closed doors and windows. The air is drawn along the floor towards the grate; it is then warmed by the heat which pervades all objects near the fire, and part is carried up the chimney with the smoke, whilst the remainder, partly in consequence of the warmth it has acquired from the fire, and partly owing to the impetus created in its movement towards the fire, flows upwards towards the ceiling near the chimney breast. It passes along the ceiling, and as it cools in its progress towards the opposite wall, descends to the floor, to be again drawn towards the fireplace.

Thus the open fire, whilst continually removing a certain quantity of air from the room, which must be replaced by fresh air, causes an efficient circulation of the air remaining in the room. Moreover, a room warmed by an open fire is pleasanter than a room warmed by hot-water pipes. A warm body radiates heat to a colder body near to it. The heat rays from a flame or from incandescent matter pass through the air without heating it; they warm the solid bodies upon which they impinge, and these warm the air.

Where the source of heat in a room consists of hot-water pipes, or low-pressure steam-pipes, the air is first warmed, and imparts its heat to the walls. The air is thus warmer than the walls. When a room is warmed by an open fire, on the other hand, the warming is effected by the radiant heat from the fire, which passes through the air without sensibly warming it; the radiant heat warms the walls and furniture, and these impart their heat to the air. Therefore the walls in this case are warmer than the air. Consequently, in two rooms, one warmed by an open fire, and the other by hot-water pipes, and with air at the same temperature in both rooms, the walls in the room heated by hot-water pipes would be some degrees colder than the air in the room, and therefore colder than the walls of a

[1] From the address by Captain Douglas Galton, at the Sanitary Congress, Croydon, England.

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room heated by an open fire; and these colder walls would therefore abstract heat from the occupants by radiation more rapidly than would be the case in the room heated by an open fire. And to bring the walls in the room heated with hot-water pipes to the same temperature as the walls in the rooms heated by the open fire would require the air of the room to be heated to a degree beyond that necessary for comfort, and therefore to a greater amount than is desirable. Moreover, warmed air contains less oxygen than cooler air, and as sick persons are more sensitive to such influences than persons in health, these may be the reasons why, in hospital wards, the warming by means of an open fire has always been preferred to warming by hot-air or hot-water pipes.

With complicated buildings, such as theatres, legislative assemblies, prisons, etc., the problems of ventilation are more difficult and intricate, but are all based on the same principles of the movement of air.

Another group of questions relating to sanitary construction are: What are the best materials for the house, and the best distribution of those materials? How can the less pure air from the ground be prevented from entering the house through the basement? What is the effect of the porosity of materials on the health of the inmates of a house? What is the law which regulates the loss of heat through walls and windows, skylights and roofs? For instance, if we assume that the loss of heat through a wall 9 inches — *i. e.*, one brick — thick, with a temperature inside the room 2° above that outside, would be one unit for a given area of surface of wall, the loss of heat through a wall built of two half bricks — *i. e.*, 4½ inches — on each side of a central air space, would be two thirds of the loss of the solid wall. Similarly the loss of heat through a double window would be about three fifths of that through a single window. The laws which govern these questions are as complicated as those which govern the strength of materials, or the flow of water, and they form the alphabet of sanitary building.

Whilst, however, I have limited myself to speaking of a theoretical knowledge, it is of essential importance that the sanitary architect, builder, or engineer should have also practical technical knowledge of the subject. He should know what constitutes a good material and good workmanship. One instance of the sanitary importance of the quality of materials will suffice here. Dust and impurities adhere less to glass of a good quality than to glass of a bad quality, because the surface of the latter becomes rough much more rapidly than the surface of glass of good quality.

THE ILLUSTRATIONS.

UNITARIAN CHURCH AT AUGUSTA, ME. MESSRS. SILLOWAY & COBB, ARCHITECTS, BOSTON, MASS.

The contractor's price for building this church, now nearly completed, was $4,500. Pews, gas fixtures, carpets, cathedral glass, in lead filled sashes, pulpit work, and decorating make the whole cost $7,000.

HOUSE AT SOUTH ADAMS, MASS. REMODELLED BY MR. W. M. WOOLLETT, ARCHITECT, ALBANY, N. Y.

The original house was built about 1800, and as far as possible the alterations correspond in style and detail with the original. Some of the carved work is very good, notably the Ionic capitals of the columns on either side of the front door.

DETAILS OF THE HOWARD BUILDING, BOSTON, MASS. MR. CARL FEHMER, ARCHITECT, BOSTON.

This drawing is one of the series that was prepared by members of the Portfolio Club.

CATHEDRALS OF MAYENCE AND SPIRES.

These cuts, which we introduce as illustrations of our correspondent's letter from Mayence, which is printed in another column, are reproduced from Seemann's Kunsthistorische Bilderbogen.

ENTRANCE HALL AND ELEVATOR-CAR, VAUGHAN BUILDING, PROVIDENCE, R. I. MESSRS. WALKER & GOULD, ARCHITECTS, PROVIDENCE.

This entrance hall is finished in ash, the floor is of tile, and the candelabra surmounting the newel is of polished brass. The principal finish of the car is ash, with mouldings, beads, and turned work of cherry, and panels and cove of white holly, decorated in oil paint. The seat, which occupies one side of the car, is upholstered in russet leather. On the side of the car, back of the seat, is a large mirror, while on the opposite side is a plate-glass directory of the building.

CORRESPONDENCE.

THE CATHEDRALS OF MAYENCE, WORMS, AND SPIRES.

MAYENCE.

In my letter from Cologne I spoke with enthusiasm of its Romanesque churches. Ascending the Rhine from that city, one finds a counter-current of architecture which widens as the river banks narrow, until the accumulated power of the style expands and culminates in the three great Rhenish cathedrals of Mayence, Worms, and Spires. On leaving Cologne the flat banks of the Rhine are without interest until the towers of the Cathedral of Bonn are seen. This is a fine old building of the eleventh and thirteenth centuries. At the junction of the Gothic nave with the fine polygonal-ended Romanesque transepts rises an octagonal tower, surmounted by an immense wooden steeple. The choir is exceptionally deep, and its circular apse is flanked by large square towers. The interior has nothing of special interest except that here again the fine effect of raising the altar high in the apse is noticeable.

From this point the banks of the river begin to justify their romantic reputation. Ivied walls and terraced gardens recall the Lake of Como; but it is curious to mark the influence of the English, who for many years have frequented this part of the Rhine, in the cottages and villas, many of which have an unmistakable English trimness. Then comes Coblentz, upon whose costly stone forts the modern engineer may look with a smile across to the distant heights whose simple and formidable earthworks may replace them. From here the river winds between the hills, vine-clad or wooded, and crowned with ruined towers. We have no time for these romantic donjons and turrets, for we should push on and give all the time we can to Mayence, an important objective point for the architect.

Mayence, with a population of 36,000, lies on the left side of the Rhine, here crossed by a long carriage bridge, upon iron pontoons; these, by the by, have rudders, and can be serviceable boats in time of inundation or war. Modern streets have somewhat cut up the town, but it still retains the comfortable quaintness of its olden time, which is a fitting frame for the magnificent cathedral. This huge pile at first sight seems of brick, so bright a red is its tint; but it has a rosy softness which belongs only to stone. On approaching it the stranger will probably be fairly puzzled. Coming up from the river he sees before him a semicircular apse terminating the nave at its junction with transepts, buttressed by slender round towers. Over the crossing rises a fine octagonal lantern, with lofty, steep-pitched roof. This has just been rebuilt, — I do not say restored, because it replaces a high Gothic lantern, with domical roof, which it may be supposed was going to ruin; this only would justify so great a change, although the new octagon is fine and well in keeping with the simple Romanesque apse. This being the apse or rear of the building, the visitor pushes on to see its front, and threading his way through the buildings which encumber the sides of the church, emerges, to his surprise, under a much larger transept, and sees a magnificent choir, with triple apses and towers, and over the crossing a great lantern tower. For a moment he may believe he has come upon another church; but a glimpse of the nave and the first lantern explains the disposition of this huge "double-ender." This disposition of a lantern and choir at each end is a characteristic of the great Rhenish churches, and though theoretically it would seem to divide the interest and injure the unity of the design, where, as in this case, the choir and lantern greatly predominate in mass and richness, no confusion can exist, and the composition groups finely about the great lantern tower. Thus did the Germans develop the Roman basilica from the Ravenna type into a great Christian and commemorative monument, for the smaller choir was intended as a tomb chapel, with a crypt below; and could anything be grander than a tomb thus placed, looking down the long nave to the greater choir beyond! The principal choir dates from the beginning of the thirteenth century, and shows something of the angular Gothic influence; for the bold semicircular apses of the earlier style are substituted ones of three sides of an octagon, the only important example in Germany of a triapsidal polygonal arrangement. These apses have on each face under the corbel-table an arcade of three double bays, and beneath this a range of engaged *colonettes*. Below, in striking opposition, is a single round-arched window in the thick wall, which is further strengthened at the angles by solid buttresses. The apses, with their slender flanking towers, form one of the most beautiful compositions I have ever seen. The transepts are simpler, but elegant, with a rich series of orders and archivolts filling the jambs of the windows, and it certainly forms a very happy transition between the more florid choir and the stern simplicity of the nave. The transitions from the earliest end, whose varied silhouette of lantern, apse, and flanking towers forms an imposing façade, without ornament, to the almost unbroken wall of the severe nave, then to the more elegant transept, and at last to the sumptuous choir, with its rich, arcaded apses, are striking, and the crescendo is superb. Successive generations, each in its own style, unconsciously worked to a most perfect artistic conclusion, and teach us, in our own more homogeneous designs, to adjust our means, be they ever so simple, so that an imposing front, a solemn nave, and richer transepts will give to any ornamentation concentrated upon the choir an extraordinary value. The great central tower which binds the whole composition together does so by its imposing mass, for its architecture is incongruous. Upon two Romanesque stories is placed a higher Gothic one, above this are two more stories in deep retreat, and the whole crowned by a florid Renaissance stone roof and finial. The small towers flanking the choir are capped with Renaissance domes, also, which give to these parts a certain rococo look. The chief defect in the design is the want of portals, which, as in many Rhenish churches, were never properly provided or emphasized. This lack of portals, or porches, is the more remarkable in that these features are one of the finest characteristics of the Romanesque in other countries. The actual entrance is in a corner of the transept, and much of the true effect of the interior is at first missed on entering; but such fine proportions cannot fail to be appreciated from any point of view. The nave is magnif-

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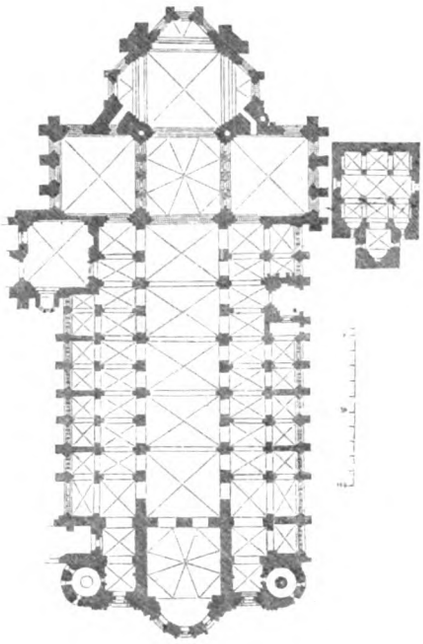
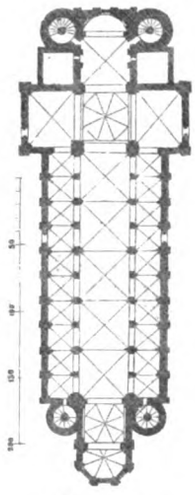


MAYENCE.



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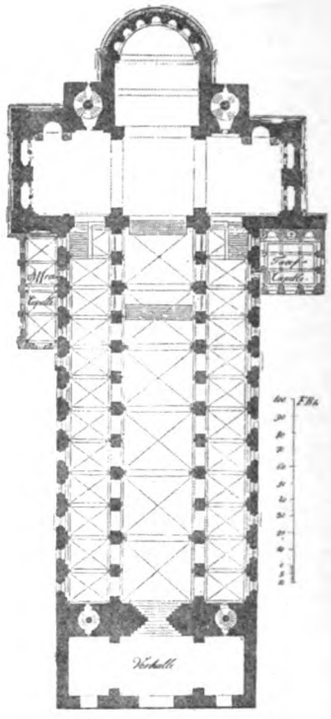

SPIRES.

CATHEDRAL AT MAYENCE.

CATHEDRAL AT SPIRES.

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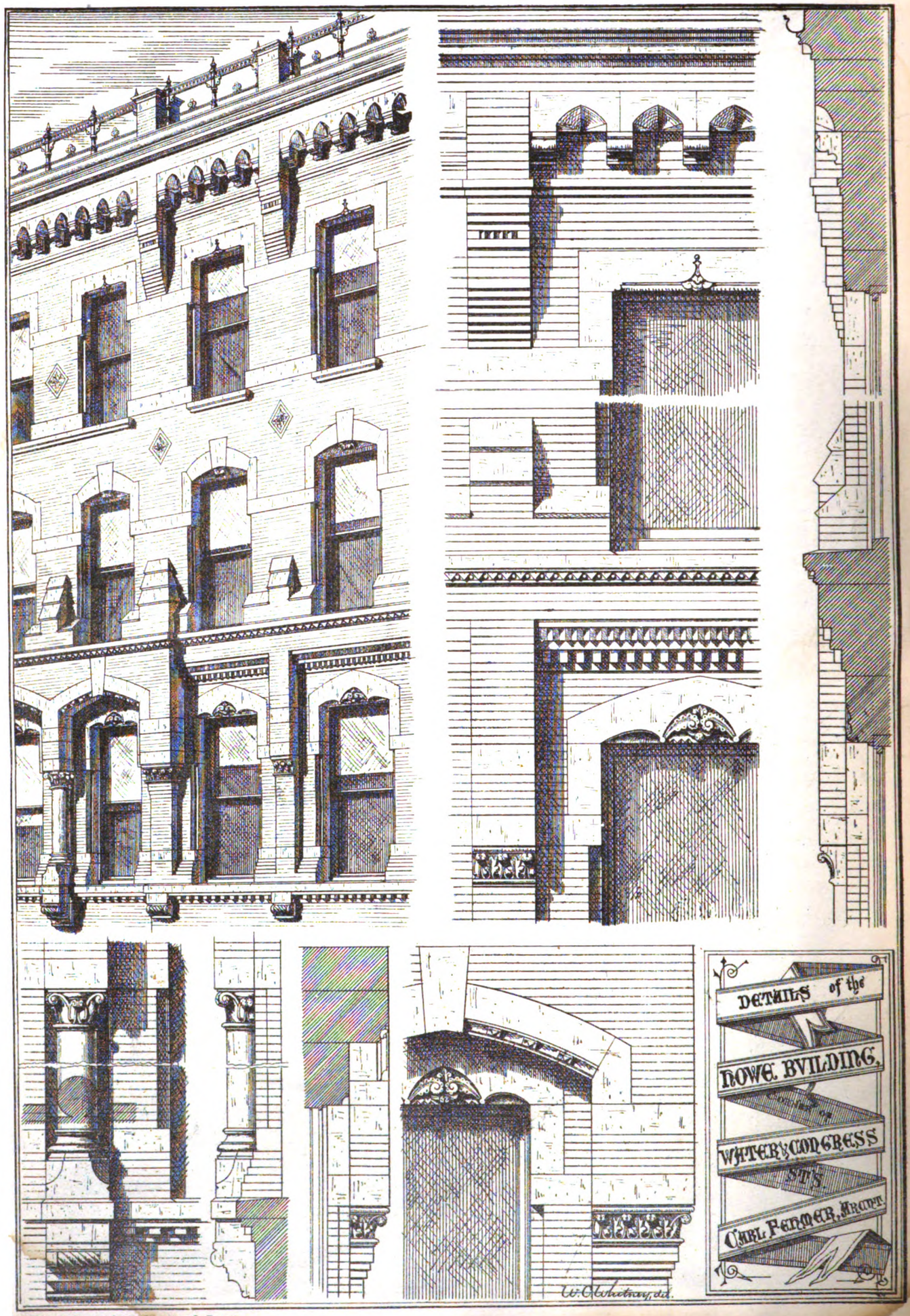

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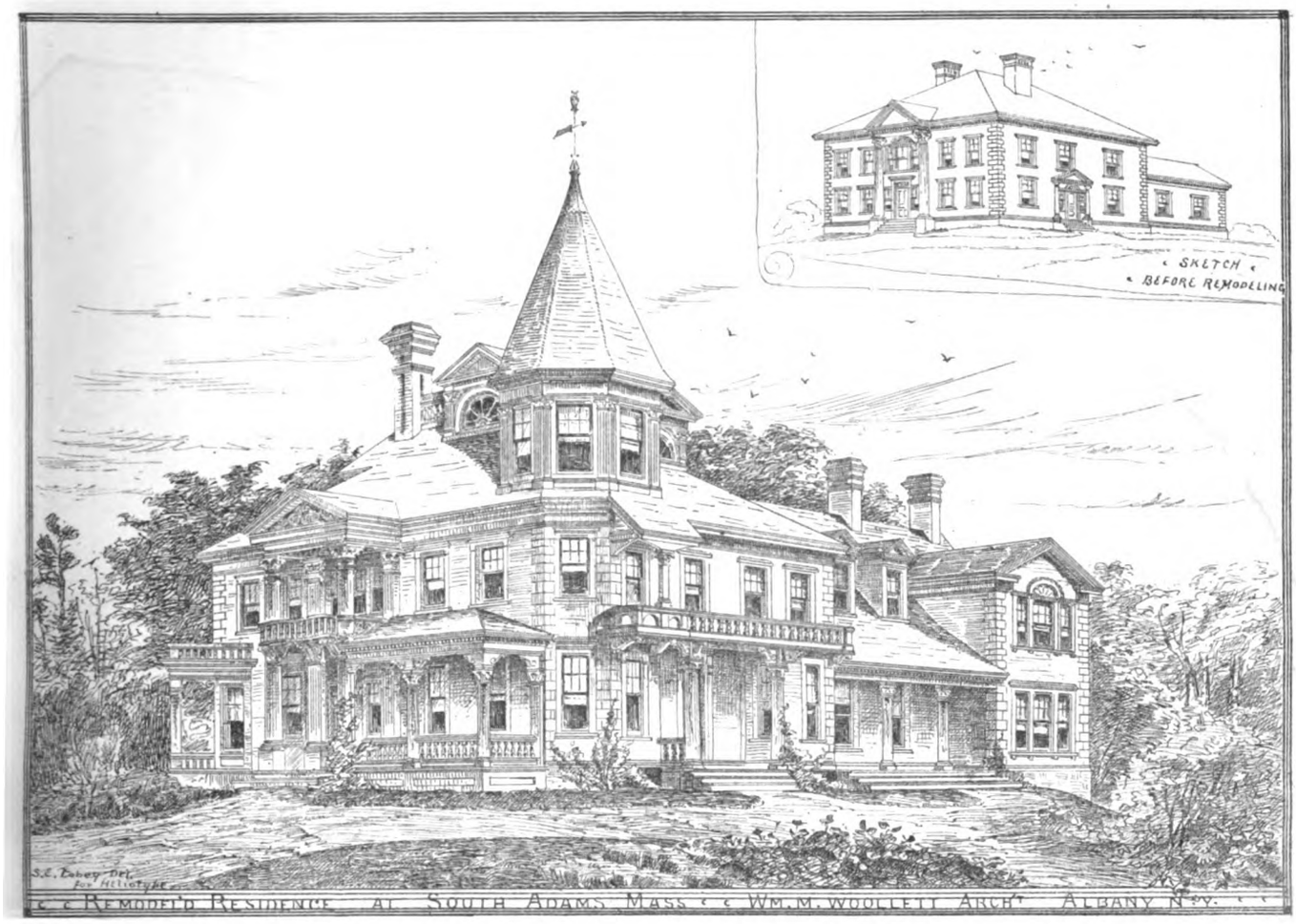
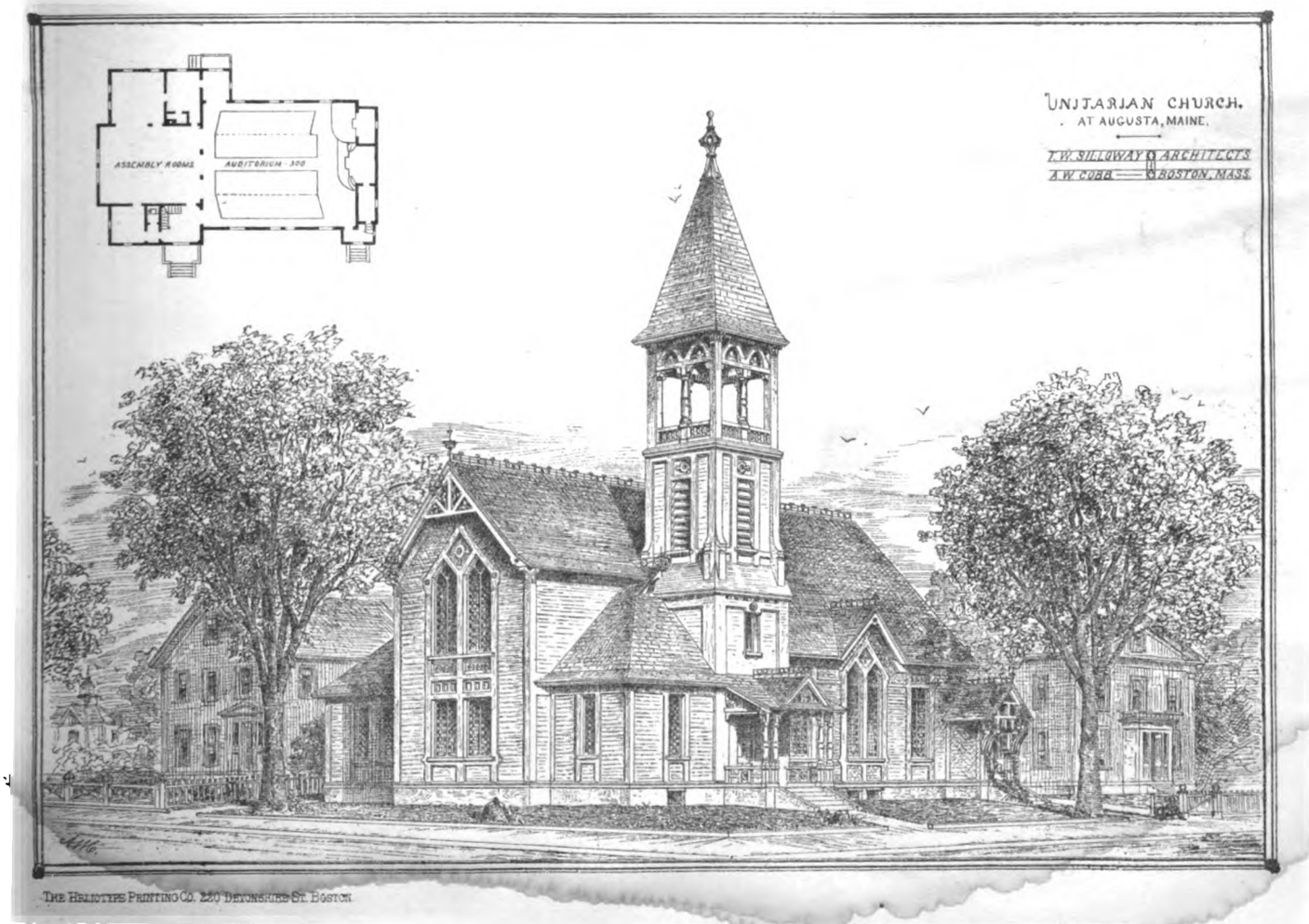


REMODEL'D RESIDENCE AT SOUTH ADAMS MASS WM. M. WOODLEIF ARCHT ALBANY N.Y.



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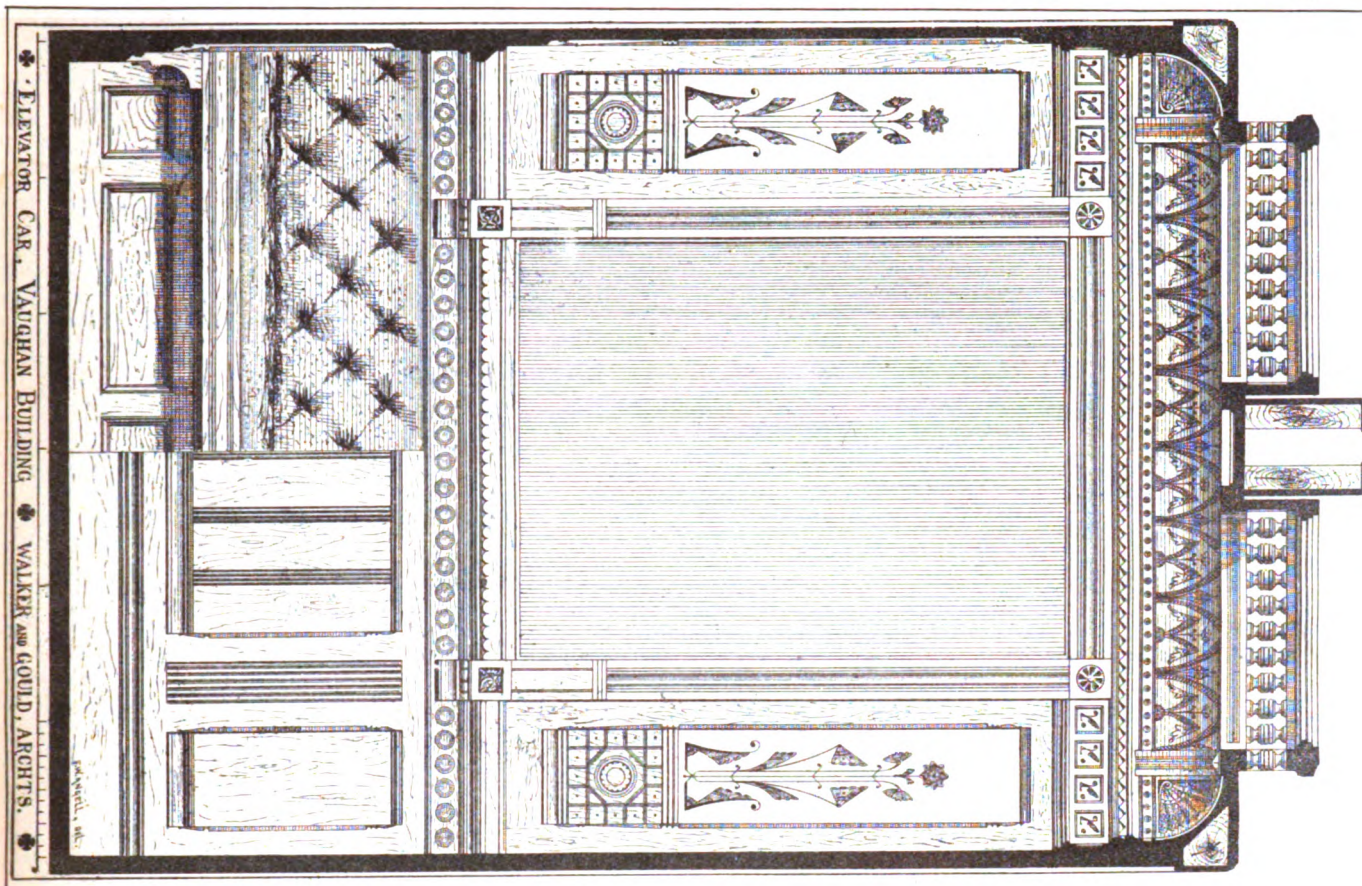
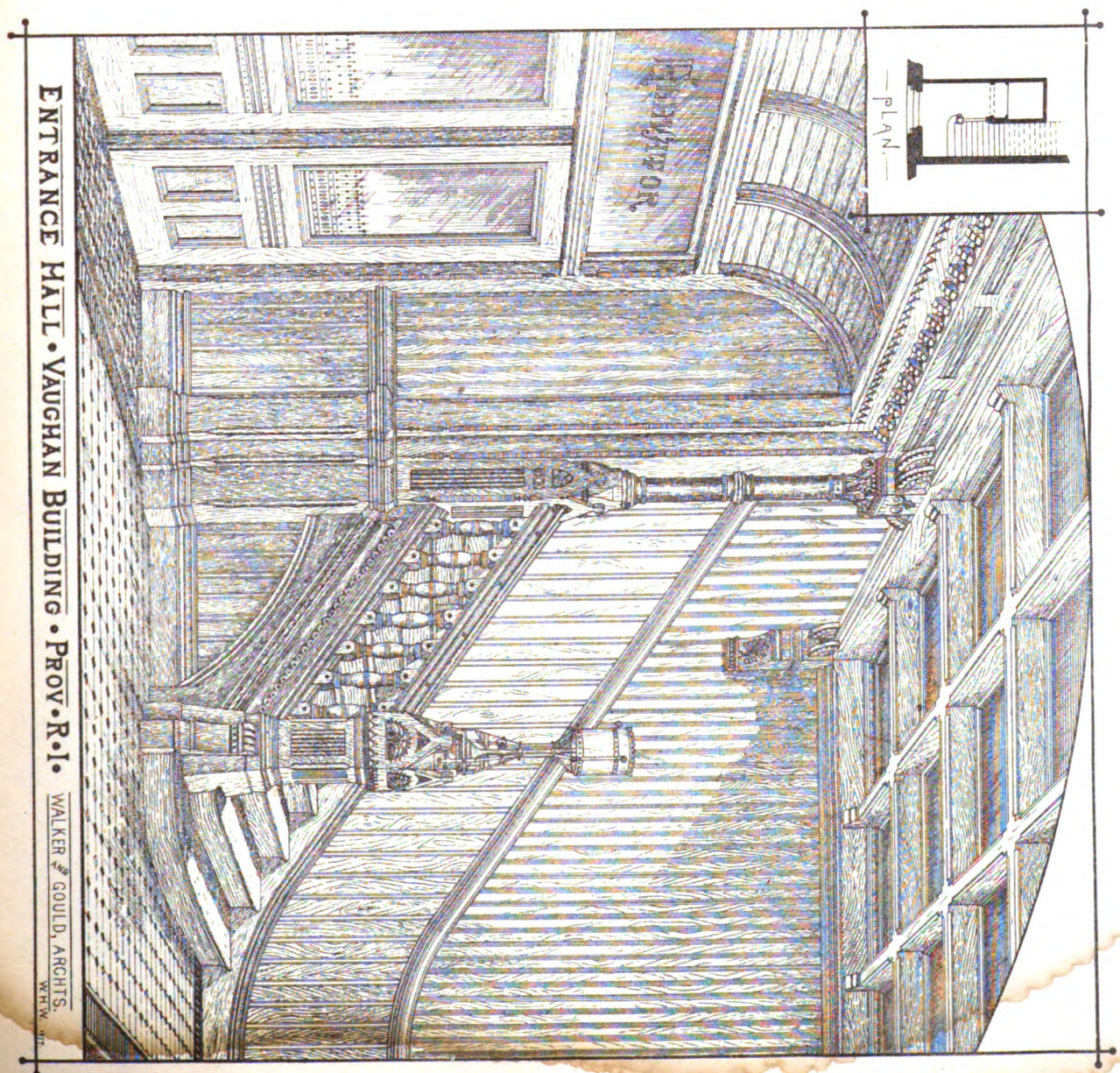


ELEVATOR CAR, VAUGHAN BUILDING. WALKER AND GOULD, ARCHTS.



ENTRANCE HALL · VAUGHAN BUILDING · PROV · R · I ·

WALKER AND GOULD, ARCHTS.

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icent. A bold vault, with a touch of the Gothic influence, spans it, and includes between the round pilasters of each bay of vaulting two of the square piers and arches of the aisles. The lines of the aisle arches are carried up on the nave wall, and enclosed by a second shallow arch, and within these spaces are painted figure compositions. The richly-stained, ruddy stone walls are reduced to a soft, warm tint by the vigorous reds and yellows of the archivolts and string courses; but these are only narrow lines of color which lead the eye down to the transepts and choir, whose vaults, as well as the interior of the lantern, have lately been splendidly colored. The surfaces generally have greenish tints in patterns. The great pendentives of the octagon have a stony, blue ground; the constructive lines generally red, varied with yellow. The decoration, in scheme and detail, is very fine, perhaps the most successful effort recently made to decorate a great building. The name of Herr Laske was given me as that of the architect who has had charge of the works on the cathedral; but I could find out little about him. Whoever designed this decoration must be a man of first-class ability. Against the piers of the nave is a wonderfully complete series of tomb monuments to archbishops of Mayence. They date from the simple black marble slabs of the eleventh century down through the various styles which culminated in the most elaborate lace-like carving of the Gothic, while the chapels and transepts have an equally complete series of the Renaissance. The dimensions of the cathedral are variously given. The German authority, seeming to me the most probable, gives one hundred and seventy-four yards long by fifty-eight broad across the transept. The aisles are simple and narrow compared with the nave, which is very spacious and lofty. Whatever may be the actual dimensions, the interior, from its proportions and simplicity, undoubtedly appears larger and more impressive than even its really great dimensions lead one to expect.

A short distance south of Mayence lies the ancient town of Worms, which was nearly destroyed in 1689; the great cathedral, however, escaped. Whereas Mayence Cathedral, begun in the tenth century, underwent modifications from the twelfth to the fifteenth century, that of Worms, begun in 1110, was completed and remains in the original Romanesque style. It is smaller than the Mayence example, being one hundred and forty-one yards long, twenty-nine wide, and measures forty across the transepts. It is a basilica, with double apses and octagonal lanterns and transepts at one end; this, and the fact that at the same end the circular apse of the interior has a square outer wall, makes it difficult to recognize in the composition which is the principal choir. At either end are two handsome round towers, an octagon covers the transept crossing, and a smaller one rises between the two towers of the opposite end. Unfortunately the larger lantern is low, and no higher than the other, so the composition does not group well, as either end asserts itself with nearly equal importance; in this respect it is inferior to Mayence, though externally the nave is the finer of the two, with large windows in the clerestory and aisles. The details also are purer and better than those of Mayence. Its entrances are in the sides of the nave, a characteristic of the Rhenish architecture, even when double choirs do not occupy the two end façades.

The third of the great Rhenish churches is at Spires. I have been rarely more impressed than I was by this noble building. As the train, after several hours of flat, monotonous scenery, stopped at the little station of Spires, I suddenly caught sight of the immense pile, above the trees, and I shall not soon forget that first glimpse of the arcaded apse, flanking square towers, great transepts, octagons, and immense nave, all surrounded with a beautiful arcade under the eaves. The effect of these vast walls, of a soft red tinge towards sunset, was overwhelming. The great church stands in a small park at the beginning of the single street of the little town, whose modest houses seem to be dwindling and shrinking away. The end towards the street has a magnificent porch or narthex the whole width of the nave and aisles. It was rebuilt by Hübsch in 1854–8, supplying amply the want of porches which exist in its two great rivals at Mayence and Worms. This vestibule, or Hall of the Emperors, as it is called, contains the statues of the eight emperors buried in the crypt, beginning with that of Conrad II., who founded the cathedral in 1030. The other dates of the building are undecided; but the building was finished before Gothic influence in any way weakened its majestic solidity, and Mr. Fergusson cites it as the finest example in Europe of a building conceived in a truly Doric spirit. The massive walls are perfectly plain throughout their width and height up to the dark shadows of the arcade beneath the roof. The great transepts are square, with huge buttresses at the angles. Solid square towers fill the angle between transepts and choir, and the great octagon is covered with a domical roof; these, with the circular apse, form a superb group. At the other end of the vast nave are similar square towers in the angles of the porch, which being the height nearly of the nave, and with the same projection as the aisles, appears from the sides like transepts. Over the central compartment of the vestibule is a second and smaller octagon. The façade of this end, as rebuilt by Hübsch, is of elegant design, but has been too much modelled upon the black and white architecture of the north of Italy, and is more pretty than this "Doric" style allows. The carving of capitals in this new porch is remarkably fine. So grand a vestibule is a severe trial for the nave, but the latter is equal to any test, and opens magnificently under its lofty round vaults. It looks as large as Mayence, although the same authority above quoted gives its length as one hundred and forty-seven yards, width across the transepts sixty, with a breadth of nave between the piers of fifteen. Its height is one hundred and five feet. It is probably the fine proportions of the nave, which is of extraordinary width and height, magnified by its bold simplicity, which gives such exceptional grandeur to this interior. The aisles are also admirably proportioned. In short, I know of no church whose simple proportions, without aid from optical tricks, are more grandly effective. The transepts project twice the width of the aisles, and are, as well as the short choir, raised ten or twelve feet high above the nave. As the choir, with its apse, has little more depth than the transept, they form together a splendid hall, reached by a flight of steps the whole width of the nave. Near the transept in the aisles steps lead down to the crypt, whose size, extending beneath the transepts and choir, and colossal piers and vaults render it the most imposing crypt I have ever seen. The interior was entirely decorated in 1845–54 by Schwarzmann, or under his direction, and Schrandolph painted the thirty-two principal figure compositions. To my mind it is an entire failure. The noble walls are enveloped in a cold gray tone, like a chilly mist, and the warm ruddy stone hidden beneath a coating of gray plaster. What a contrast with Mayence, where a few lines of strong color upon the bare stone walls give the richest effect; whereas here the most elaborate decoration looks poor and cold. There is no system; and a complication of patterns, added to a want of strongly accentuating bands of color, produces a weak, uncertain effect. The figure compositions are as timid in color. The nave vaults are a pale blue, with brown ribs picked out with red, those of the aisles yellowish, with similar ribs; the prevailing tone of the walls is greenish gray, often with lilac and pinkish patterns. The dome of the large lantern, however, is fine; it has a solemn range of figures covering the lower half of the gilt vault, but its bold simplicity only brings out the weak elaboration of the other decorations. The sacristy has vaults of brick laid without cement, and the clean, dark joints produce a pretty effect. Although Heidelberg, but an hour or so from here by rail, is crowded by tourists, few ever think of coming to see this splendid building. Mayence, being a comfortable stopping-place on the Rhine, is better known, but few who visit this region ever visit or hear of Worms.

The Germans, incited by their glorious political achievements, now boldly lay claim to supremacy in all directions. The present fashion for mediævalism has tempted them to claim the invention of Gothic architecture, — than which nothing can be more preposterous, in view of historical evidence and that of their buildings themselves, which betray a style applied by architects who, precisely because the initial development did not come from Germany, never fairly understood an architecture indigenous to France and England. The perverseness of this claim is the more striking in that they undervalue the noble architecture which, by their own native efforts, had already attained monumental qualities never yet surpassed, and which only needed time for the development of its great resources to give them a truly national style, perhaps unrivalled in any land. When we see how experiment after experiment was necessary for the perfect development of the Gothic, as for every mature style, the imagination is fired by the thought of what might have been attained with these Rhenish monuments as a *point de départ*, — for these three great cathedrals were built, it should be remembered, about the same time, and after only a few experiments. The question for us is, whether a style of such solid grandeur, however capable of development in the Middle Ages, when time and labor were almost unchallenged factors in building, can find favor in a century of cheap and rapid construction. There is one consideration, however, which will certainly recommend it to our serious attention erelong. Our generation recognizes the advantages of painted decoration over the more slow and costly work of sculptors, and it is on the broad wall-surfaces of this style that the painter will find his best opportunity. The experimental spirit now awakened in all countries will sooner or later certainly seize upon this style, and, as far as recent designs show, Germany may see her quick-witted rivals across the Rhine, convinced that the Golden Age of the Gothic is passed, return to and appropriate as their national style that very architecture from which they lured the Germans five centuries ago. Recent competitions seem to indicate this. In that for the construction of a Protestant cathedral in Berlin about twelve years ago, the designs, even when domical and classic in plan, were chiefly Gothic, while the designs submitted in 1874 for the great church of Le Sacré Cœur, in Paris, were nearly invariably Romanesque. I am astonished to find, however, how little French architects have drawn material from the Rhenish Romanesque, since they have studied so thoroughly the kindred style in the south of France; but this may be accounted for by their general indifference to all art outside of their own country and Italy, and to the fact that in no works on architecture are the churches on the Rhine adequately represented. A more complete knowledge of the latter would certainly give a great impetus to their present efforts. The best books on this architecture are by Geier and Görz, Rosengarten, and Boisserée's Nieder Rhein; but the two former give small illustrations, and the lattter is confined to Cologne and its neighborhood. Hübsch, in his Altchristliche Bauwerke gives the Cathedral of Spires on a large, or rather coarse, scale, and in a German student publication there are outline drawings, on a large enough scale, of these churches; but it may be said that this Rhenish architecture

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has never yet been fairly illustrated. Magnificent as are Cologne and Strasburg, they are only variations of a cathedral type scattered all over Europe, and if pressed for time on the Rhine, I should urge the lover of architecture to sacrifice them rather than the true Rhenish architecture, which is unique. R.

HOMES FOR WORKING PEOPLE.

HOW THEY ARE BEING CONSTRUCTED IN ENGLAND.

A model home for working people is described in a letter to the *Spectator* (London). The plan has been designed and executed by John Ellis, at Seacombe, Cheshire. The cottages are built in detached hexagonal blocks, each house forming one segment of the hexagon, having a separate entrance. A central shaft containing flues for each house secures economy of heat and fuel, and affords an equable temperature throughout the several rooms. Mr. Ellis utilizes this centralization of heat in providing an ingenious but simple method of ventilation, the continuous current of the main shaft carrying off the vitiated air and making smoky rooms an impossibility. Fresh, warmed air is admitted from a flue in the chimney-breast, which prevents draughts as well as the smoke nuisance. The cottages are two stories high; the ground floor contains the living-room and scullery; the first and second floors each provide one large or two small bed-rooms. The shape of the rooms may be objected to, but this is in a great measure overcome by placing cupboards at the angles next to the fireplace or central shaft, so that the want of symmetry is hardly noticed. Mr. Ellis maintains that, by arranging these blocks face to face, with a proper interval for front garden and roadway, he is able to economize building area while providing more breathing space to each house than can be offered by building a similar class of houses in rows, in the ordinary way. By dispensing with the obnoxious back yard and passage, with their litter, dirt, and bad smells, extra room is gained in front for the garden. In construction, the expenses of numerous chimney stacks, lead flushings, and outside walls are greatly lessened. At a rent of 6*s.* per week, covering water and all other rates, the dock laborer or common sailor of Liverpool and Birkenhead finds himself provided with a clean, healthy, cheerful home.

COMMEMORATIVE MONUMENTS IN WASHINGTON.

The erection of a monument to the late General George H. Thomas by the Army of the Cumberland, in this city, early in November, will prove a valuable addition to the art attractions of Washington. The first statue erected in this city was the colossal marble monument of Washington now standing in the East Park of the Capitol. This was ordered in 1832 by Congress for the rotunda of the Capitol, and was designed by Horatio Greenough of Massachusetts. It was made in Florence, Italy, and occupied eight years in its completion. It weighs twelve tons, and its total cost, including the sculptor's work, freight, removal, and attendant expenses, was $44,000. It was found to be so entirely out of proportion to the interior of the Capitol that it was removed to the East Park, where it now stands in solitary grandeur. It bears the famous legend, "First in war, first in peace, and first in the hearts of his countrymen." It also has the following inscription: "This statue is for a great example of liberty, nor without liberty would this example endure."

The next monument erected was the bronze one of General Andrew Jackson, in Lafayette Square, by Clark Mills, which was unveiled on the 8th of January, 1853, Stephen A. Douglas delivering the oration. Five years previous to this date the Jackson Monument Association, composed of admirers of the general, collected about $12,000 for the purpose of procuring this testimonial. Congress, in addition, appropriated a number of brass guns and mortars for its construction, besides voting the money for the marble pedestal. By a further appropriation of $20,000, in 1853, Congress bought the statue and made it the property of the United States. Its total cost was $50,000.

Shortly after the erection of this figure, Congress ordered the erection of a monument to Washington, costing $50,000. It was placed in the circle at the intersection of Twenty-third Street and Pennsylvania and New Hampshire Avenues, where it has become a landmark. Congress gave the metal used in its construction, and Clark Mills was the sculptor.

Scott Square, at the intersection of Massachusetts and Rhode Island Avenues and Seventeenth Street, takes its name from the equestrian statue of General Winfield Scott, which was erected in 1874, seven years after it was ordered by Congress. The metal used in its casting was cannon, trophies of the general's valor in Mexico, given by Congress. It weighs 12,000 pounds and cost $20,000.

In Rawlins Square, on New York Avenue, northwest, stands a heroic bronze statue of General John A. Rawlins. This was ordered by Congress in 1872, and erected two years later. It was executed by J. Bailey, of Pennsylvania. It cost $10,000, is eight feet high, and weighs 14,000 pounds.

The Lincoln statue, in the park of that name, on East Capitol Street, was built by funds contributed by the negroes declared free by the Emancipation Proclamation, under the lead of James Y. Yeatman, of St. Louis, the amount subscribed being $17,000. Thomas Ball designed the monument, and Miller, of Munich, executed the casting. It is twelve feet high.

The bronze equestrian statue of General McPherson stands in the square of that name, on Vermont Avenue, between I, K, and Fifteenth Streets. This monument was erected by the Society of the Army of the Tennessee, and was unveiled October 18, 1876, General John A. Logan being the orator. Congress appropriated the cannon for its construction, and its cost was $23,500. It is 14 feet high.

General Nathanael Greene, of Revolutionary fame, has been commemorated in a statue erected upon Stanton Square, Capitol Hill, at the junction of Massachusetts and Maryland Avenues. It was ordered by Congress in 1876, and placed in position a year or two later. The commission was for $50,000, which included the pedestal, the latter being furnished by the artist.

The marble statue of Lincoln, in front of the city-hall, is the work of Lot Flannery. Its cost was defrayed by patriotic citizens. Flannery was a self-taught sculptor, who combined energy and enthusiasm with a slight modicum of genius. Among the proposed statues, other than that of General Thomas, is one yet to be erected to Admiral Farragut, in Farragut Square, on Connecticut Avenue, between I, K, and Seventeenth Streets. The monument is to be of colossal height, of bronze, for which Congress appropriated $20,000 in April, 1872. Vinnie Ream, the sculptor, has completed the plaster cast, and will soon mould it in bronze. — *Washington Post.*

LEAD PAINTS IN THE ENGLISH CLIMATE.

True cleanliness is a matter of minutiæ, and admits of no subterfuge. If dirt can find a crack, a ledge, or an absorbent surface which cannot be reached by the ordinary method of cleansing, there dirt will accumulate; and where dirt is there will disease be also.

To avoid the possibility of dirt finding shelter in our domestic habitations, what must be done? Carry out, says the scientific sanitarian, the minutiæ of cleanliness by insisting upon an almost microscopic inspection, and use every valid means to maintain the large surfaces of the walls and ceilings as free as possible from injurious matters which may be absorbed or given out.

If we are to look to our neighbors for painstaking cleanliness, we must go to Holland, for example, where it is popularly believed that no gastronomic injury would ensue from dining directly off the flooring boards or tiles. Beyond the delightful duty of scrubbing everything which is not painted, the Dutchman and his wife find no such esoteric and sanitary delight as in painting everything which cannot be scrubbed or rubbed bright. And the Dutchman is *right*. No layer upon layer of paper hangings, with brown, gray, or green arsenical dust to slowly poison the more susceptible of the family. No sham plaster walls, porous to sewer-gas and corrupted with putrefied paste, can be allowed. If we have lath and plaster, let it be painted; and if we cannot have wainscot or mahogany kept brilliant by continual cleanly friction and polish, let us have a clean painted wooden surface, as artistic in tint and in the disposal of the colors and decoration as taste and means will afford; but, to carry out a determined war against dirt and disease, let us have paint. These are no longer notions peculiar to the Dutch. They are sanitary axioms which we cannot afford to ignore.

But there is another side to the proposal "to paint and believe in paint." As I observed in the commencement of this paper, sometimes the very means taken to keep our dwellings clean add to the real dirt. So it is with paint, for there be paints *and* paints; some leave little to be desired, from a hygienic point of view; others, as I shall show, are injurious to health, and even deadly in their own direct effects.

In July, 1873, I was instructed to investigate the causes which brought about, I believe, some of the severest cases of lead poisoning ever made public. I found at Devonport Dockyard twenty-four cases had occurred among the shipwrights working there, dating between May 3d and the 30th of June. There were sixty-four painters employed, and on the average, about four cases of lead-poisoning per annum were reported among these men, or at the rate of eight per cent of those engaged in laying on the white-lead paint. When the space to be painted was confined and ill-ventilated, the symptoms produced were such as Dr. Thomas Brown, R. N., described in his report, which, by the permission of the Director-General of the Medical Department of the Navy, I am able to quote. "After a few weeks' work, a pasty, lustreless look appeared upon their faces. There was a sense of great depression and weakness together with headache and loss of appetite. A metallic taste was sometimes complained of, and a blue line was observed upon the margin of the gums. It was only after persevering for some weeks that the graver symptoms were produced, and the men, becoming *wholly incapacitated*, sought medical advice."

But it was among the shipwrights that the symptoms appeared in a still more aggravated form. These men were employed in cleaning off Day's cement, together with the paint and red lead. All the symptoms previously enumerated were presented, but in a more intense degree, attended with greater depression, and in every case epigastric tormina was described as a dull, heavy pain, giving the sensation of the bowels being drawn toward the spine. Cramps in the muscles of the extremities were common and of great severity, but it was observed with surprise that there were no cases of paralysis. The most stringent precautions have since been taken; perfect clean-

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liness of the skin and frequent washing of the working clothes were insisted on. A chemical respirator was recommended to be worn while at work, and sulphuric acid drinks were always to be kept in readiness. No precautions, however, prevent the use of white or red lead paints being exceedingly injurious, both to the painters and to those who inhabit rooms in which the paint has not perfectly dried.

Now comes the important question, How long a time must elapse before white lead paints can be considered so perfectly dried as to be absolutely free from diffusing their injurious influences?

I will reply that it depends upon circumstances over which we have frequently no control. I state this feelingly, as in my house, a few doors from Grosvenor Square, London, the whole staircase from top to bottom has paint upon it which is not dry now, although it was laid on Easter last while I was at Brighton.

The slightest greasy deposit upon the old paint will prevent white lead paints from ever really drying, and while a skin of comparatively hard paint cheats the superficial observer, there is a continual exosmosis of volatile poisons being given off. The truth is not revealed until a general tone of depression and lowered vitality throughout the house arrests the attention of observers on the look-out for such causes and effects. Or, perchance, the spirit of cleanliness, that handmaiden to the goddess Hygeia, insists upon an early cleansing of the paint all over the house; with the unsuspected result of detaching the false skin of the new paint, and leaving the greasy undercoat which no length of exposure will ever dry.

It is no exaggeration to assert that very little paint containing white lead as its basis becomes so hard and dry within months of its application as to preclude the possibility of poisonous matters being given off.

I have had distinct proof that the injury accruing from the diffusion of lead in the air exists to an extent far surpassing the well-known poisonous influence of minute quantities of lead in drinking-water. I have, therefore, always recommended the substitution of zinc white for white lead, for the all-important reason that it is harmless. Many reasons, however, tend to limit the use of the ordinary zinc white (oxide of zinc), the weightiest of which are that it does not possess the body of white lead, will not cover so much surface, and is, therefore, not so economical either in labor or in cost. Several coats of zinc oxide are required to equal the opacity of white lead, and in mixing with other colors a much larger quantity of zinc oxide must be used.

I have lately had brought before me a new preparation of zinc which is stated to have overcome all these defects. As I have carefully investigated its properties, I am happy to find that we have at length obtained an antiseptic white zinc paint which is free from the objections raised against zinc oxide. I find the oxy-sulphide of zinc pigment, invented by Mr. Thomas Griffiths, of Liverpool, to be a very curious instance of the fulfilment of the demands of sanitary science. We insisted that we must have a non-poisonous white as the basis of the oil paints used in our dwellings. Zinc oxide was proposed, and, I believe, large fortunes have been made out of its manufacture, notwithstanding the drawbacks. The economies of labor and expense must, however, be included in the demands of sanitation, or the use of the best and most harmless of pigments is certain to be evaded. The fiat of the trade is issued against it, and it becomes doubly dear and difficult to insure its use.

Oxy-sulphide of zinc is then brought forward, as dense as white lead and as opaque, its covering qualities even exceeding the lead paint; and, as it does not change color like white lead, and is as cheap, all things considered, we may welcome another powerful auxiliary, which, while innocent of itself, will help us immensely in our campaign against dirt and disease. — *H. C. Bartlett in the Sanitary Register.*

THE HYPÆTHRAL QUESTION.

CAMBRIDGE, November 24, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — In the postscript to his letter on the Hypæthral Question in the last number of your journal, Mr. Thomas Davidson, referring to my communication in your issue of August 30, in which I "invoked in favor of Mr. Clarke's essay the authority of Dr. Reber, of Munich," says: "What Dr. Reber's unsupported authority is worth may be judged from the single circumstance, very germane to the present question, that in his Kunstgeschichte des Alterthums (Leipzig, 1871), which Professor Norton considers 'the best existing concise history of ancient art,' he treats with sarcasm and contempt the well-established fact of the curvature of the horizontal lines in Greek temples. (See the criticism of Koumanoudhis in the *Ἀρχαιολογικὴ Ἐφημερίς*, 1874, page 481.)"

Mr. Davidson's assertion is, I regret to say, so completely at variance with the truth, that I can only suppose him to have been misled by reliance upon the paper of Mr. Koumanoudhis to which he refers (and which I have not seen), and not to have taken the precaution to consult Reber's own pages. There is no foundation whatever for the charge that Dr. Reber "treats with sarcasm and contempt the well-established fact of the curvature of the horizontal lines in Greek temples." On the contrary, he gives a clear account of the discovery and of the nature of the curvature, and discusses the practical and æsthetic motives for this refinement of construction. (See his Kunstgeschichte des Alterthums, 1871, pages 206-208.)

In his Geschichte der Baukunst im Alterthum, Leipzig, 1866, in treating of the same question, Reber took the position that as yet there was not conclusive evidence that the curvature was a designed result of the original construction. He did not question the *existence* of the curvature, but argued that its *origin* was not positively determined.

In his Kunstgeschichte,, five years later, he says, "The supposition of the originality (*ursprünglichkeit*) of the curvatures, which the author felt obliged to question some years since, becomes better and better established (*mehr und mehr für sich gewinnt.*)"

It appears plain that Mr. Davidson has permitted himself to make positive and incorrect statements concerning the opinions of Dr. Reber. Faithfully yours, C. E. NORTON.

THE OPEN FIRE-PLACE.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — I have read the article in the *Metal Worker*, to which you refer me.

The only remark made in it which would be of interest to your readers is, though contradictory in itself, still liable to mislead, and therefore calls for a reply.

The critic objects to my statement that when the surfaces of iron furnaces become red-hot they may decompose the air itself, and says: "Air, by passing over a red-hot stove, is not decomposed. A small amount of oxygen might, when the iron was perfectly clean, be absorbed by it." The result of this absorption is oxide of iron. The oxygen of the air unites with the iron, and we have a separation of the two gases mechanically mixed in the air. Here is, therefore, at once a contradiction. But as iron rust is not an acid gas injurious to the health, and is not the substance to which I referred, the remarks in regard to it are irrelevant. The critic is evidently ignorant of the fact, now well known to science, that the oxygen of the air combines at high temperatures with the carbon of the iron, forming carbonic oxide, which *is* a gas injurious to the health. (See the Comptes Rendus of the French Academy of Sciences, May 3, 1869, report of the commission appointed to investigate the matter.)

The report shows that carbonic oxide is produced (1) by the direct action of the air upon the carbon in the iron heated to redness; (2) by the *decomposition* of the carbonic acid in the air by its contact with the metal heated to redness.

Henry Watts, in his Dictionary of Chemistry, page 331, says: "When cast-iron is heated to redness in the air *the carbon it contains is first oxidized*, and the metal rendered more or less malleable, then a crust of magnetic oxide is formed at the surface, and gradually increases in thickness, as in the case of malleable iron."

Bernan, in his treatise on Warming and Ventilation, page 205, says: "When the stove, as is frequently the case, gets red-hot, it may *decompose* the air itself."

Joly, in his Traité du Chauffage et de la Ventilation, page 162, says: "D'après les discussions qui sont consignées dans les comptes rendus de l'Académie des Sciences, en date du 3 mai 1869, il serait prouvé que les poêles en métal *portés au rouge* peuvent donner lieu à une formation d'oxyde de carbon, gaz éminemment toxique, et que cette formation peut provenir: (1) De la perméabilité de la fonte par la gaz qui passerait de l'intérieur du foyer à l'extérieur; (2) *de l'action de l'oxygène de l'air sur le carbon de la fonte;* (3) de la *décomposition* de l'acide carbonique de l'air par son contact avec le métal; (4) de l'influence de l'acide carbonique formé par la respiration, ou par les poussières et les miasmes organiques en suspension dans l'air. Voilà pour les données récentes de la théorie."

See also Ure's Dictionary of Arts, Manufactures, and Mines, and Wagner's Jahresbericht, vol. xiv., page 55, where iron is shown to be permeable to hydrogen gas even when cold: "L. Cailletet uberzeugte sich, dass das Eisen, nicht nur wie Deville und Troost nachgewiesen, im stark erhitzten Zustande, sondern auch bei gewöhnlicher Temperatur von Wasserstoffgas durchdrungen werde."

I prefer to take the testimony of the French Academy of Sciences, of Tremy, Payen, St. Clair, Deville, General Morin, of Henry Watts, Bernan, Tomlinson, and numerous other scientists of note who might be quoted, to say nothing of careful experiments made in corroboration by myself, to the unsupported and self-contradictory statements of the *Metal Worker*.

The critic would have found his other questions to be sufficiently answered further on in the article he criticises, had he only waited patiently for its completion.

Respectfully yours, J. PICKERING PUTNAM.

A QUESTION OF COPYRIGHT.

NEW YORK, November 25, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — If you will compare the enclosed circular with the illustration of Mr. Dorman's house, published in the *American Architect*, Vol. VI., No. 196, you will see that it is a literal copy of our design.

We write to you, therefore, to inquire what protection we have from such piracies in future; whether you would be willing to prosecute such tradesmen (as your paper is copyrighted)? Or if you would not be willing to start a "black list" of "pirates," with the name of this firm at the head?

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We do not object to the publication of our designs in your paper, as we presume your readers to be of too respectable a class to copy outright; but when we find tradesmen spreading our design broadcast over the land (by mail), we decidedly object to the matter, and therefore look to you for protection.

Yours truly, See & Berg.

[Our reply to one of our correspondents' questions will be found in the last paragraph of this week's Summary. As we feel assured that the offence was committed in ignorance of the real impropriety of the act, we do not think it will be necessary to crucify the offender at the head of a "black list." — Eds. American Architect.]

NOTES OF EXPERIENCE AND INEXPERIENCE.

39. The Blue Copying Process. — I have been using the "blue copying process," and like it very well; but I saw some prints that were brown the other day. Can you give me the *modus operandi* for making them?

S. E. Todd, Jr.

[Will some of our readers who have used this process give our contributor the information he needs?]

NOTES AND CLIPPINGS.

Notes from the President's Message. — *The New State Building.* This department was enabled during the past year to find temporary though crowded accommodations, and a safe depository for a portion of its records, in the completed east wing of the building designed for the State, War, and Navy Departments. The construction of the north wing of the building, intended for the use of the War Department, is being carried forward with all possible dispatch, and the work should receive from Congress such liberal appropriations as will secure its speedy completion. — *Egypt's Ancient Obelisk.* The action of the Egyptian Government in presenting to the city of New York one of the ancient obelisks which possess such historical interest is highly appreciated as a generous mark of international regard. If prosperity should attend the enterprise of its transportation across the Atlantic, its erection in a conspicuous position in the chief commercial city of the nation will soon be accomplished. — *The National Library.* The library gathered at the Capitol still remains unprovided with any suitable accommodations for its rapidly increasing stores. The magnitude and importance of the collection, increased as it is by the deposits made under the law of copyright, by domestic and foreign exchanges, and by the scientific library of the Smithsonian Institution, call for building accommodations which shall be at once adequate and fire-proof. The location of such a public building, which should provide for the pressing necessities of the present, and for the vast increase of the nation's books in the future, is a matter which addresses itself to the discretion of Congress. It is earnestly recommended as a measure which should unite all suffrages, and which should no longer be delayed. — *The Washington Monument.* The joint commission created by the act of Congress of August 2, 1876, for the purpose of supervising and directing the completion of the Washington National Monument, of which commission the President is a member, has given careful attention to this subject, and already the strengthening of the foundation has so far progressed as to insure the entire success of this part of the work. A massive layer of masonry has been introduced below the original foundation, widening the base, increasing the stability of the structure, and rendering it possible to carry the shaft to completion. It is earnestly recommended that such further appropriations be made for the continued prosecution of the work as may be necessary for the completion of this national monument at an early day.

Building Accident. — The front and back walls, with the roof, of the new Baptist church, on James Street, Hamilton, Ont., fell in this week. Loss, $40,000.

How the Dome of the United States Capitol escaped Destruction. — A Sunday newspaper publishes the following: —

"In order to lend especial brilliancy to the scene in the rotunda of the Capitol on Thursday night, when the ball of the Society of the Army of the Cumberland was given, every gas jet in and around the immense space was put into requisition. Something like one thousand, therefore, were lighted that had not been used during the preceding eleven years. All at once, at about eleven o'clock, while the gayety was at its height, all the gas in the upper lofts of the rotunda went out instantly. There was considerable commotion among the guests, while the officials of the building rushed around to repair the accident. It was supposed that the 1,300 jets in use, which had so mysteriously ceased burning, might be pouring out a great volume of gas, which might at any time explode. At this critical juncture the Capitol electrician, Mr. Rogers, quickly mounted to the top of the interior and turned off the stop-cock of every burner. Almost miraculously, however, a valve in the supply-pipe had acted automatically, not only thus shutting off the flow of gas, but holding it back also. Had not this been the case, and if Mr. Rogers had not been at hand, there would have been an explosion that night which would have brought down the entire dome of the Capitol in huge fragments upon the heads of the assembled hundreds, among whom were the President and Cabinet officers."

Persons who attended the ball had no knowledge that the gas supply failed at any time.

Roman Villa at Waldorf, Germany. — Excavations at Waldorf, in Germany, have brought to light the remains of a Roman villa, with a frontage of two hundred feet. They lie near the site of an extinct volcano, and although the mosaics and wall painting which adorned the palace have been found in a very shattered and fragmentary state, the existence of the large villa alone confirms the opinion that the volcanoes of the Rhine at the time of the Roman occupation had long ceased to be dangerous.

The Empress Eugénie as the Goddess of the Republic. — An amusing discovery has just been made at the town-halls of several French villages of plaster busts of the Republic, which are nothing else than former busts of the Empress Eugénie, slightly altered by the addition of a bundle of corn-ears in the hair, and a Phrygian cap or some other republican attribute. It seems that an enterprising firm of plaster-casts merchants, having purchased at a discount, shortly after the 4th of September, 1870, all the effigies of the ex-empress which were on the market, have, by making these judicious alterations, succeeded in disposing of their wares with considerable profit.

Michael Munkacsy's Great Picture. — Milton Dictating Paradise Lost to his Daughters has arrived from Munich, its last place of exhibition, at its future home, the Lenox Library in New York city. It was bought, it will be remembered, in June, 1878, at Paris, by Mr. Robert Lenox Kennedy, for presentation to the above institution. The price paid was some 100,000f. ($20,000). Mr. Munkacsy received for it, when it formed part of the Universal Exposition of 1878, a grand gold medal of honor, the cross of officer of the Legion of Honor, and the universal praise of the French and other foreign critics. Since then it has been exhibited at Berlin, Vienna, Buda-Pesth, London, everywhere attracting great attention, and finally at the recent Munich International Art Exhibition, where the painter received one of the eleven first-class medals for painting.

Evaporating Pans on Stoves. — An almost universal practice in winter is to place on the stove a pan of water, with a view to purify the air by absorbing the carbonic acid contained in it. Dr. Polli, of Milan, who has long been engaged in investigations on this subject, is wholly opposed to this system. According to him, the water does not absorb carbonic acid, but, on the contrary, adds to it by the decomposition of the carbonate of lime contained in all drinkable water in greater or less proportions. The white incrustations found on the sides of the vessels are, in fact, formed by the deposit of sub-carbonates and sulphates of lime, produced by the evaporation of the water, and the principal part of the carbonic acid having been given off to the surrounding atmosphere. M. Polli proposes instead to place on the stove pans containing quicklime, which after a few days augments in volume and is transformed into carbonate of lime by absorbing the carbonic acid in the air. By this means the atmosphere is constantly purified, but at the same time is rendered very dry. To obviate this inconvenience, vessels containing water may be placed about the room in positions where they are not subject to the immediate action of the fire, and they will give off by their evaporation sufficient humidity to render the air agreeable without adding to the quantity of carbonic acid already present. — *London Times.*

Preservation of Wood. — The improved French method of preserving wood by the application of lime is found to work well. The plan is to pile the planks in a tank, and to put over all a layer of quicklime, which is gradually slacked with water. Timber for mines requires about a week to be thoroughly impregnated, and other wood more or less time, according to its thickness. The material acquires remarkable consistence and hardness, it is stated, on being subjected to this simple process, and the assertion is made that it will never rot. Beech wood prepared in this way for hammers and other tools for iron-work is found to acquire the hardness of oak without parting with any of its well-known elasticity or toughness, and it also lasts longer.

Discovery of an "Old Master." — An artist of St. Omer, says *La Chronique des Arts*, in travelling about the neighborhood of Arras, noticed that, beneath the coats of whitewash which covered the ceiling of an exceedingly primitive privy of the house where he was lodging, there appeared traces of color. Scraping away a little of the whitewash he soon made certain that the ceiling was formed by an old painted panel. It was not hard to persuade the proprietors to sell the ceiling, and the artist had the good fortune to find that the panel, when carefully cleaned, revealed a painting of Christ at the foot of the cross which dated from the sixteenth century. The name of the master does not transpire.

Theatre Fires. — Almost all the theatres in the leading cities have been burned down at some time or other. In London alone, 56 actual theatre fires, and an unknown number of alarms, have taken place. A laborious compiler has discovered that the average life of a theatre is only 22¾ years. Thirteen theatres per year have been destroyed in 30 years, a majority in the middle of the week. Of 252 burnt, 5 happened before opening, 70 in the first 5 years after opening, 38 in from 6 to 10 years after opening, 45 in from 11 to 20 years after opening, 27 in from 21 to 30 years after opening, 12 in from 31 to 40 years after opening, 20 in from 41 to 50 years after opening, 17 in from 51 to 60 years after opening, 7 in from 61 to 80 years after opening, 8 in from 81 to 100 years after opening, 3 upwards of 100 years after opening. — *Exchange.*

A Clever Photographer. — A photographer at Scarborough, England, who died lately, was famous in the business for the shrewd way in which he induced persons to order portraits in oil, when they had intended only to sit for card photographs. Selecting the most pleasing of two or three negatives which had been taken, it was handed into a distinct department, fitted up for rapidly producing transparencies. A transparency obtained, it was placed in a magic lantern kept ready, and a life-size image was thrown on the screen. The photographer had, in the mean time, invited the sitter into a gallery of life-size portraits, well painted in oil, and handsomely framed. These, of course, elicited admiration, and eventually he led his visitor into the room where a fine portrait of himself was presented life-size on the screen. The effect, as all photographers know, is very striking, and fully admits of a little eloquent talk on its fitness for painting.

Building in Paris. — House building has been more active in Paris this year than has been known since the Franco-Prussian war. The number of new houses is 658, comprising 2,615 stories. Rents, nevertheless, keep up at the figure reached last year in consequence of the Exhibition.

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THE clever article on the Capitol of New York, in the December *Scribner's*, by Mr. Montgomery Schuyler, has recalled the controversy of three years ago over the architecture of that building. What it says about this is of interest, because it shows how the most intelligent laymen, and naturally then the general public, may fail to allow for the real professional point of view of architects in such a controversy as this and others, of which there are many, that turn on like considerations. As for the old quarrel itself there is not much to be said. The protest of the architects against the change in the original design seemed to us intemperate and hasty, — as we said at the time, with some offence to our friends, — and it is not strange that it brought some disparagement of the profession with the public, or provoked keen retorts from persons who were quicker to resent its tone than to recognize the ideas that lay behind it. The question was taken up on all sides by the defenders of the revised designs first presented by the Advisory Board, and the opposition of their critics was received as if it had been simply a question between two styles, or of purity of style. It was really a question of design, and of such a juxtaposition of visibly discordant styles as made a conspicuous dislocation of the design at half height. Now, if there is anything for which American architects to-day are notable, it is not for purity of style; moreover, as Mr. Schuyler well says, "at most, fidelity to style is but a means to artistic quality." But the first of purely artistic qualities is unity, and it is for its friendliness to artistic unity that purity of style is intelligently valued, and for its hostility to unity that a jumble of styles is intelligently condemned. Different styles may indeed be mingled in the same design so as to produce unity in the result, but this requires both unusual skill and unusual pains. For most designers it is far safer to adhere with considerable steadiness to one style, for the reason that a style is itself the result of the prolonged endeavors of many successive designers to adjust a series of forms to artistic unity. The more completely each of two styles is at one with itself, the more will their discordance be emphasized when they are juxtaposed. We will not claim purity of style for the original design of the Capitol at Albany, and no one will claim it for the design of the Advisory Board; and this was not the question, but they were consistent enough, each with itself, to be in very visible conflict with each other.

IN the case of the Albany Capitol, then, the question of style was prominent, simply because it was the mask under which the greater question of unity presented itself. If it had been raised for its own sake, whatever opposition individuals might have made, there would have been no general protest. The opposition that might have been raised would probably have failed of effect, if the design of the Advisory Board had shown a careful and skilful effort to fuse and adjust the different styles, so as to give unity of effect. "If it could not be made pure," says Mr. Schuyler, "it seems praiseworthy to attempt making it at least peaceable." It would have seemed so, certainly, and the justification of the opposition of the whole profession was that, in the new design, as first presented, no such attempt was made. It was not an effort for peace, but a plain declaration of war. The upper half of the exterior bore written upon it the expression of open hostility to the lower half. It was more than this; for the absolute denial in the upper half of all consideration for the lower savored of ostentatious contempt, and, in view of the close relation of the different stories, had the disagreeable effect of a conspicuous family quarrel. It was a *scandalum magnatum*, a public washing of dirty linen. No excellence of the design of the upper stories could overcome the ill effect of this discord, or make it, we think, anything less than intolerable. It was only natural, if artists who believed that unity of effect was the first essential of a work of art had even preferred the carrying out of the first design, with its monotony and its feebleness of detail, to this discordant union, had that been the only alternative. But it was not the only alternative. Every architect knew that all the good qualities which were shown in the new design could be secured as well in another, which, if not identical in style, should at least fairly harmonize with the older work; that the transition from the old to the new could be accomplished without the violent jolt which was proposed. It may be said, then, without any reference to the personal aspects of the controversy, that it was natural, and, considering the importance and publicity of the matter, it was reasonable, that whoever had an interest in it, and had a right to raise his voice in a thing of public concern, should make his appeal for a different solution of the difficulty.

THE wisdom of the change, and the usefulness, though not the manner, of the opposition that was made to the proposed design, are amply justified by the result. The New York legislature passed a resolution that the exterior of the building should be carried out, as it was begun, in Italian Renaissance. This restriction, which has been not too rigorously interpreted, but sufficiently heeded to avoid undue violence of transition, made it easier for the architects to recede from an untenable position, and has given them an opportunity to recast their design at leisure. There is no question, as we said once before, that the building has gained greatly by the change of architects: it is unquestionable that it has gained as greatly by the change from the first modified design. For, be it remembered, the design of the new stories as they are carried out differs more absolutely from that against which the opposition was made than it does from the intention of the first designer. It adds to the good qualities of the design of the Advisory Board those which are due to a longer study of the problem, and a considerate endeavor to unite the new and the old without a jar, seconded by the harmonizing influence of a resemblance in style which is sufficient to avoid a shock to a catholic mind. As for the shibboleth of style, to which, as Mr. Schuyler hints, the legislature of New York bowed without understanding its meaning, with not too great a veneration for it we may say that for once it seems to have done good service. Doubtless the legislators did vote for the Italian Renaissance without knowing what it meant, but after all it served them as a formula which they could use to secure a good end, if they did not understand the means to it. In truth, when unskilled persons meddle so much in questions of art as they do among us, we may be thankful if the name of a style saves them from losing their way altogether, as it sometimes does. And in the matter of the Albany Capitol it seems at least to have helped the people of New York to a tolerably good solution of an awkward complication.

THE energy of M. de Lesseps seems likely to be the spur to drive not only his own countrymen, but ours, to the work of building an inter-oceanic canal. The pity seems to be the danger that the activities which it sets in motion will be divided in the making of two canals, when one is enough, not only for the needs of commerce, but for the means which both countries could easily be persuaded to contribute to the project. M. de Lesseps, in spite, it is said, of some disappointment in the subscriptions to his company's stock, is bent on giving his enterprise the advantage of being the first on the field. He proposed to sail from France on last Saturday, and with so much assurance of carrying through his plan that he would take his family and establish himself at the Isthmus. He also carries two contractors who have worked with him on the Suez Canal, with the necessary apparatus to begin work at once. He has bought out from its owners the concession formerly granted for the Isthmus Canal, and has his resident engineer already there. He pro-

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poses to solidify the general interest in his scheme by forming a commission of eminent engineers from various countries, among whom he hopes, we are told, to include General Totten, of the United States Engineer Corps, having been outbidden by the projectors of the Nicaragua scheme in his proposition to secure General Grant as honorary president of his company.

M. de Lesseps's last *Bulletin du Canal Interocéanique* was a sort of parting manifesto before setting out. In it he pays his respects to the American opposition, saying that it has not a leg to stand on, and that the Monroe doctrine, instead of being an obstacle to his plan, should tell in its favor, inasmuch as the enterprise is undertaken under a concession from the government of Colombia. He sums up the case between his route (the Panama line) and the Nicaraguan route, which its projectors would like to impose upon the people of the United States as the American route, by repeating that the Nicaraguan line is four times as long as the other, and by virtue of its score of locks would make several days' delay in the transit, which is costly, and that the actual expense of construction would be no less than for its rival, in spite of promising estimates. The country it traverses is subject to earthquakes, while the Isthmus is not; the outlet to the Lake of Nicaragua is crooked and difficult, and the thirty curves of the canal to it are of too short radius to allow for the easy turning of a large steamer. He cites the almost unanimous decision of the European engineers at the Congress against the Nicaraguan line, and accusing the American engineers who have conducted the surveys of having been led away by a preconceived idea, he says: "Here is a people who have spent in twenty years twenty-five or thirty millions of francs in sending their most competent men to study the Isthmus. Their best engineers and their best sailors have been upon all the coasts of the Atlantic and the Pacific, and have examined all the passes; but their studies did not furnish a practical solution, because they always contemplated a canal with locks." He adds that "the Americans had a kind of cold chill on seeing that a solution was found which had escaped them, because they studied the question from one side only."

These objections to the Nicaraguan Canal are known, and are substantially those which were brought forward against it in the discussion of Mr. Menocal's paper upon it at a late meeting of the American Society of Civil Engineers. To these Mr. Shelburne, in the discussion, joined the criticisms that the canal as planned was inadequate and its estimated cost too low, its locks being too small and its section not large enough, so that to make it serviceable, thirty millions of dollars must be added to the cost; that the canal would be much more difficult to construct than had been counted on, and more difficult to protect when built. The objections that are urged against the Panama Canal we have before enumerated. They are, briefly, its great initial cost and the danger to it from freshets, as well as the difficulties of the tides, which Mr. Menocal thinks will interfere considerably with its use. Meanwhile, the imminence of the Lesseps project has stirred up its opponents here to great activity. A joint resolution has been introduced into both houses of Congress, committing the United States, in a rather reckless way, it seems to us, to the support not of an inter-oceanic canal simply, but a canal "via Nicaragua," which is declared to be "a necessity for the prosperity of the commerce of the world and the interests of the United States," and, with a vagueness which would give good cause for uneasiness, to a "full and entire protection" of its company. It is a misfortune that an undertaking of this kind, whose *raison d'être* is its importance to the commerce and common service of the whole world, should be embarrassed among us who are most immediately concerned in it, not as a nation, but as a commercial people, by political notions and the mere pride of country; and it is likely that the support which the undertaking gets here will be mainly due to the fact that it is an American project, and one that is made to appear as if it were the representative American project, to the name of General Grant, if he lends his name to it, and to such considerations as were adduced by Senator Burnside in his speech of last week, which we must fain consider a weak one. Shrewd capitalists will judge the matter as one of commercial profit, but the next thing will be an appeal to Congress for a subsidy, and before Congress the question will become one of politics and bunkum. It is not our province to discuss the Monroe doctrine, which is essentially the same in spirit as the theory on which England has made her Afghan and Zulu wars, but when it is stretched to cover the undertakings of private foreign capital, in which our own capital is invited to join, it seems to be stretched to tenuity. It is an absurd waste of force to build two inter-oceanic canals close together, when it is a question whether one alone is not too great a work to undertake; but to this things seem to be tending.

There is no longer much likelihood that either protests from home or resistance at Alexandria will prevent the American emissaries from bringing Cleopatra's Needle to New York. The protests, indeed, were entered much too late to accomplish anything, even if there had been a chance of it from the beginning. Americans were too much preoccupied — ourselves among them, we must confess — to consider at the beginning the full extent of the injury to Alexandria and the offence to the world involved in this abstraction, which, notwithstanding that the act of spoliation was really committed by the late Khedive in the moment of abdication, resembles too much in spirit the pilfering of the Elgin marbles. But when many thousands of dollars had been spent in preparations, and the ship and machinery which were to bring back the obelisk were already at Alexandria, it was no longer of use to protest, under the certainty that no opposition but that of law or of force would be allowed to prevail. Those who have lifted up their voices can only lament, if they hoped to have any effect, that they were not more wide-awake or more enterprising. As for the opposition at Alexandria, there appears to have been none among the natives. The Alexandria of the future, if civilization overtakes her, will doubtless bitterly lament her acquiescence; but the present Alexandria cares nothing for infidel relics or pre-Mohammedan associations. The only resistance which amounted to a real obstacle seems to have been that of the Italian proprietor on whose land the Needle stood, and that was easily overcome by vigorous action and the pledging of a quarter of the five thousand francs which he demanded. A despatch sent to the *World* by Commander Gorringe, on Saturday, told that the obelisk had been actually lowered into its horizontal position. A pit had been dug about it, and a canal led out to the sea, through which it was to be rafted to the ship that waited for it. The excavation about the base exposed a plinth of red syenite (the material of the obelisk), seven feet high by nine square, below which were three marble steps, resting on a foundation of masonry. The plinth is to be brought here with the shaft. With the steps beneath it, the bottom of which is about eighteen inches above the sea-level, it adds nearly fourteen feet to the height of the structure, showing what has been the accumulation during eighteen centuries of the sands which have choked the famous harbor of Alexandria.

The New York Superior Court has rendered judgment in the suit against the city of the widow of the man who was killed by the fall of the Forty-Second Street Tunnel in New York. The suit was dismissed on three grounds, which amount to this: first, that the city could not be held responsible for the consequences of a want of judgment on the part of the Commissioner of Public Works in fixing the form and construction of the vault that fell; second, that there was no error of judgment, for the balance of testimony indicates that if the vault had been faithfully built as it was planned, it would have been strong enough; third, that the error of judgment was on the part of the man who went under the vault when he was warned not to. We have heard this plea of error of judgment from those in authority before, and with very little respect. We gave our reasons at the time (see *American Architect* for October 26 and November 2, 1878) for believing that the vault was planned in a way in which no competent engineer would have planned it. But letting alone this special case, the plea of error of judgment seems to us like that of drunkenness, which may be made to cover pretty much any but premeditated mischief. We do not see that there is any blunder of shameful incompetence or outrageous folly that cannot be covered by it. The building of the stand that fell in Blackstone Square, in Boston, a year or two ago, was an error of judgment. The building of the grand-stand at Adrian was another. If cities are not responsible for the damage done by their servants in such ways, why should corporations be, or why should individuals? If the plea of error of judgment is restricted to cases in which a thoroughly informed and careful human judgment could not foresee the result, that is one thing; but if it is to be used with the loose interpreta-

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tion which seems to belong to it in this case and another in which we have lately noticed it, we may look to see it held up as the ægis of incompetence and folly.

THE Permanent Exhibition at Philadelphia still shows some vitality, or its supporters do. A meeting of stockholders was held a week ago, in which it was voted unanimously that the Exhibition should be maintained and the great centennial building in the Park preserved. This, we presume, implies an intention to accept the conditions of the Park Commission and provide a genuine industrial exhibition of a kind to do credit to the city, instead of the somewhat miscellaneous shows which have occupied the building and wearied the patience of the Commission for a year past. It is keeping up a brave front. The question remains how well the promises of the stockholders can be redeemed by the successful carrying out of a scheme which has failed before under what seemed better opportunities.

STRENGTH OF COLUMNS.

THE use of columns or pillars in buildings is so common that every architect and builder should be able to determine the exact load that a given pillar, or column, will bear with safety.

Usually, those who have written upon this subject have entered so deeply into scientific considerations, that the majority of those who should apply their formulæ have been unable to understand them.

The following formulæ and tables are deduced from the best authorities on this subject.

The following is the notation employed in the formulæ:—

Let A denote the area of the cross-section in square inches; B, the external breadth, or *least thickness*, of a square or rectangular pillar, b, the internal breadth of a hollow pillar or column, both in inches; C, the resistance to crushing of one cubic inch of the material; D, the external diameter of a cylindrical column, or the depth of a square or rectangular pillar; d, the internal diameter or depth of a hollow column or pillar; E, the modulus of elasticity; L, the length of column or pillar *in feet*: l, the length of column or pillar *in inches*; W, the greatest load that the pillar will sustain *with safety*.

It has been found that the manner in which a column or pillar breaks depends upon the ratio of its length to its diameter, or least thickness. Hence pillars have been divided into *Short*, *Long*, and *Medium*.

Short Pillars. — Under this class are placed pillars of cast-iron whose lengths do not exceed five times their least thickness; and pillars of wrought-iron and wood whose lengths do not exceed ten times their least thickness or diameter.

The safe load for a pillar of this class is obtained by the general formula, $W = \frac{A \times C}{5}$, 5 being the factor of safety. In special cases we have: for solid square or rectangular pillars,

$$W = \frac{B \times D \times C}{5};$$

for solid cylindrical pillars,

$$W = \frac{\pi \times \frac{1}{4} D^2 \times C}{5}, \text{ or } W = \frac{3.1416\ D^2 \times C}{20};$$

for hollow rectangular pillars,

$$W = \frac{(B \times D - b \times d)\ C}{5};$$

and for hollow cylindrical columns,

$$W = \frac{3.1416\ (D^2 - d^2) \times C}{20}.$$

VALUES OF C, OR RESISTANCE TO CRUSHING, IN POUNDS PER SQUARE INCH.

	Lbs.		Lbs.
Cast-Iron	80,000	Hemlock	5,400
Wrought-Iron	36,000	Locust	7,650
Steel	114,000	White Oak	6,660
White Ash	8,140	White Pine	4,800
Beech	8,540	Pitch Pine	6,770
Birch	11,660	Spruce	6,820
Cedar	5,860	Black Walnut	5,690

EXAMPLE: What is the greatest load that a pillar of white pine, 6 × 8 inches, and 6 feet long, will bear with safety?

Ans. $W = 6 \times 8 \times 4{,}800 \div 5 = 46{,}138$ lbs.

Long Pillars. — Under this class are placed columns and pillars of cast-iron and timber whose lengths exceed thirty-five times their least thickness; and columns and pillars of wrought-iron whose lengths exceed sixty times their least thickness or diameter.

There are no formulæ that are entirely satisfactory for the strength of long columns. The following are deduced from the theoretical formulæ of Weisbach and others; breaking weight $= \frac{\pi^2 E I}{l^2}$. Using for long columns a greater factor of safety, 10, we have $W = \frac{\pi^2 E I}{10\ l^2}$; or, for solid square or rectangular pillars,

$$W = \frac{E \times B^3 \times D}{1{,}750\ L^2};$$

for hollow square or rectangular pillars,

$$W = \frac{E \times (B^3 \times D - b^3 \times d)}{1{,}750\ L^2};$$

for solid cylindrical columns,

$$W = \frac{E \times D^4}{2{,}970\ L^2};$$

for hollow cylindrical columns,

$$W = \frac{E \times (D^4 - d^4)}{2{,}970\ L^2}.$$

VALUES OF E, OR MODULUS OF ELASTICITY, IN POUNDS PER SQUARE INCH.

	Lbs.		Lbs.
Cast-Iron	15,960,000	White Oak	1,620,000
Wrought-Iron	24,000,000	Southern Pine	1,700,000[1]
Steel	31,000,000	White Pine	1,410,000[1]
White Ash	1,080,000	Yellow Pine	1,600,000
Locust	2,046,000	Spruce	1,600,000

EXAMPLE: What is the greatest load that a wrought-iron cylindrical pillar, whose diameter is 5 inches, and length 30 feet, will bear with safety?

Ans. $W = 24{,}000{,}000 \times 5 \times 5 \times 5 \times 5 \div 2{,}970 \times 30 \times 30 = 5{,}611$ lbs.

The above formulæ apply to long pillars of any material; but for cast-iron, we have the more satisfactory formulæ derived by Mr. Ernest Hodgkinson from his experiments on the strength of cast-iron columns:—

For solid cylindrical cast-iron columns, with flat ends,

$$W = \frac{9{,}890\ D^{3.6}}{L^{1.7}};$$

for hollow cylindrical cast-iron columns, with flat ends,

$$W = \frac{9{,}923\ (D^{3.6} - d^{3.6})}{4^{1.7}}.$$

The diameter and length can be raised to the required power by obtaining the logarithm of the diameter or length, multiplying it by the respective power, and then seeking the number corresponding to the logarithm; or it may be found by means of tables made for the purpose, such as those given by Mr. Trautwine in his hand-book for engineers.

If it is desired to obtain the *breaking weight* of a long pillar, multiply the *safe weight* by 10.

Medium Pillars. — Under this class are placed those columns or pillars in which the ratio of the length to the diameter, or least thickness, is between that of the two classes already considered. Most of the columns and pillars in common use come under this class. The formulæ in most general use for this class of columns are those deduced by Mr. Lewis Gordon from Mr. Hodgkinson's experiments. But for timber pillars, Mr. Tredgold has altered Gordon's formula, so that it will give results agreeing more nearly with those obtained by experiments. Mr. Tredgold's formula for square or rectangular timber pillars is,

$$W = \frac{A \times C}{10\left(1.1 + \frac{L^2}{2.9\ B^2}\right)}.$$

For cylindrical pillars, find the safe weight as if the pillar were square, and divide by 1.7.

EXAMPLE: What is the greatest load that a white oak pillar, 10 inches square and 15 feet long, will sustain with safety?

Ans. $W = 6{,}660 \times 100 \div 10 \times \left(1.1 + \frac{225}{2.9 \times 100}\right) = 35{,}501$ lbs.

The following are Mr. Gordon's formulæ for the forms of cast and wrought iron pillars in most general use:—

For solid cylindrical columns of cast-iron,

$$W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{266}\left(\frac{l}{D}\right)^2\right)};$$

for hollow cylindrical columns of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{8{,}000}\left(\frac{l}{D}\right)^2\right)};$$

for hollow cylindrical columns of cast-iron,

$$W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{400}\left(\frac{l}{D}\right)^2\right)};$$

for hollow cylindrical columns of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{4{,}500}\left(\frac{l}{D}\right)^2\right)};$$

for hollow or solid rectangular pillars of cast-iron,

$$W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{600}\left(\frac{l}{B}\right)^2\right)};$$

for solid rectangular pillars of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{8{,}000}\left(\frac{l}{B}\right)^2\right)};$$

for hollow rectangular pillars of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{6{,}000}\left(\frac{l}{B}\right)^2\right)};$$

[1] Obtained from experiments made by the writer.

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for H-shaped section of wrought-iron,

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{l^2}{8{,}000\, B^2} \frac{a}{a+b}\right)}$$

in which B = breadth of flange, a = area of both flanges, and b = area of web.

In the above formulæ for medium pillars, the numbers in the denominator printed in heavy type are factors of safety, and should be omitted in obtaining the *breaking weight*.

The formulæ for medium pillars are in such a form that tables can be calculated for different values of $\frac{l}{D}$ or $\frac{l}{B}$, giving the safe or breaking load per square inch of cross-section. Below are tables for pillars of oak, white pine, pitch pine, and spruce; for hollow cylindrical and rectangular cast-iron columns; and for hollow cylindrical and rectangular wrought-iron columns.

To use these tables it is only necessary to divide the length *in inches* by the breadth if rectangular, or the diameter if cylindrical, also in inches, and, looking in the first column of the table for the whole number nearest that quotient, take out the safe load per square inch, and multiply it by the number of square inches in the cross-section.

Thus: What is the greatest safe load of a wrought-iron hollow cylindrical column, whose external diameter is 5 inches, and internal $4\frac{1}{2}$ inches, and whose length is 15 feet? Here $\frac{l}{D} = 36$, and, looking in the table for the strength of wrought-iron columns, we find opposite 36, under safe load, 6,987; multiplying this by the area of the cross-section $= .7854\ (D^2 - d^2) = 3.73$ square inches, we have greatest safe load = 26,061 pounds.

In order to make a table for timber pillars we have to change the formula by substituting $\frac{l}{12}$ for L, and the formula then becomes:

$$W = \frac{A \times C}{10\left(1 + \frac{1}{417.6}\left(\frac{l}{B}\right)^2\right)}.$$

If the pillar is cylindrical, divide the results by 1.7.

STRENGTH OF RECTANGULAR TIMBER PILLARS.

$$W = \frac{A \times C}{10\left(1.1 + \frac{1}{4.6}\left(\frac{l}{B}\right)^2\right)}.$$

Length divided by Breadth.	Safe Load in Pounds per Square Inch.			
$\frac{l}{B}$	White Oak.	White Pine.	Pitch Pine.	Spruce.
8	532	383	540	544
9	515	371	523	527
10	497	358	506	509
11	479	345	487	491
12	461	332	468	472
13	442	319	449	453
14	424	306	431	435
15	406	292	413	416
16	389	280	395	398
17	372	268	378	380
18	355	256	361	363
19	339	244	345	347
20	324	233	329	331
21	309	222	314	316
22	295	212	300	302
23	281	202	286	288
24	268	193	273	275
25	256	185	261	263
26	245	176	249	251
27	234	168	238	240
28	224	161	227	229
29	214	154	217	219
30	204	147	208	210
31	195	141	199	201
32	187	135	190	192
33	179	129	182	184
34	172	124	175	176
35	165	119	168	169

In using iron columns or pillars it is, of course, cheaper to use those of a pattern made by some manufactory, than to have new patterns made to order. Different iron mills have published handbooks of all the forms of columns, beams, etc., of their make, containing also much valuable information, which they will send to architects and builders on application.

Any one desiring further information on the strength of columns, or the manner in which the formulæ are derived, will do well to consult Professor De Volson Wood's treatise on Resistance of Materials, Rankine's Civil Engineering, and Mr. Bindon Stoney's Theory of Strains in Girders and Similar Structures.

STRENGTH OF HOLLOW CYLINDRICAL OR RECTANGULAR CAST-IRON PILLARS.

$$W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{400}\left(\frac{l}{D}\right)^2\right)}; \qquad W = \frac{A \times 80{,}000}{6\left(1 + \frac{1}{500}\left(\frac{l}{D}\right)^2\right)}.$$

Length divided by External Breadth or Diameter.	Breaking Weight in Pounds per Square Inch.		Safe Load in Pounds per Square Inch.	
	Cylindrical.	Rectangular.	Cylindrical.	Rectangular.
5	75,294	76,190	12,549	12,698
6	73,395	74,627	12,232	12,438
7	71,269	72,859	11,878	12,143
8	68,965	70,922	11,494	11,820
9	66,528	68,846	11,088	11,474
10	64,000	66,666	10,666	11,111
11	61,420	64,412	10,236	10,735
12	58,823	62,111	9,804	10,352
13	56,239	59,790	9,373	9,965
14	53,359	57,471	8,976	9,578
15	51,200	55,172	8,533	9,195
16	48,780	52,910	8,130	8,817
17	46,444	50,697	7,741	8,449
18	44,198	48,543	7,366	8,090
19	42,050	46,457	7,008	7,743
20	40,000	44,444	6,666	7,407
21	38,050	42,508	6,341	7,085
22	36,200	40,650	6,033	6,775
23	34,455	38,872	5,742	6,479
24	32,787	37,174	5,464	6,195
25	31,219	35,555	5,203	5,926
26	29,741	34,014	4,957	5,669
27	28,343	32,547	4,724	5,423
28	27,027	31,152	4,504	5,192
29	25,785	29,828	4,297	4,971
30	24,615	28,571	4,102	4,761
31	23,512	27,310	3,918	4,818
32	22,472	26,246	3,745	4,374
33	21,491	25,172	3,581	4,195
34	20,565	24,154	3,427	4,026
35	19,692	23,188	3,282	3,864

STRENGTH OF HOLLOW CYLINDRICAL OR RECTANGULAR WROUGHT-IRON PILLARS.

$$W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{4{,}500}\left(\frac{l}{D}\right)^2\right)}; \qquad W = \frac{A \times 36{,}000}{4\left(1 + \frac{1}{6{,}000}\left(\frac{l}{B}\right)^2\right)}.$$

Length divided by External Breadth or Diameter.	Breaking Weight in Pounds per Square Inch.		Safe Load in Pounds per Square Inch.	
	Cylindrical.	Rectangular.	Cylindrical.	Rectangular.
8	35,495	35,620	8,874	8,905
9	35,369	35,520	8,842	8,880
10	35,217	35,410	8,804	8,852
11	35,057	35,288	8,764	8,822
12	34,883	35,156	8,721	8,789
13	34,697	35,013	8,674	8,753
14	34,497	34,861	8,624	8,715
15	34,286	34,698	8,571	8,674
16	34,062	34,527	8,515	8,632
17	33,827	34,346	8,457	8,586
18	33,582	34,155	8,395	8,539
19	33,327	33,957	8,332	8,489
20	33,061	33,750	8,265	8,437
21	32,787	33,535	8,197	8,384
22	32,504	33,313	8,126	8,328
23	32,213	33,083	8,053	8,271
24	31,915	32,846	7,979	8,211
25	31,610	32,604	7,902	8,151
26	31,298	32,354	7,824	8,088
27	30,981	32,100	7,770	8,025
28	30,659	31,840	7,665	7,960
29	30,331	31,574	7,583	7,893
30	30,000	31,304	7,500	7,826
31	29,665	31,030	7,416	7,757
32	29,326	30,758	7,331	7,689
33	28,985	30,469	7,246	7,617
34	28,642	30,184	7,160	7,546
35	28,297	29,896	7,077	7,476
36	27,950	29,605	6,987	7,401
37	27,603	29,312	6,901	7,328
38	27,254	29,017	6,813	7,254
39	26,906	28,719	6,726	7,179
40	26,557	28,421	6,639	7,105
41	26,209	28,121	6,552	7,030
42	25,862	27,821	6,465	6,955
43	25,515	27,511	6,378	6,877
44	25,171	27,218	6,293	6,804
45	24,827	26,916	6,206	6,729
46	24,486	26,614	6,121	6,653
47	24,146	26,312	6,036	6,578
48	23,809	26,011	5,952	6,503
49	23,475	25,711	5,869	6,428
50	23,143	25,412	5,786	6,353
51	22,814	25,113	5,703	6,278
52	22,488	24,816	5,622	6,204
53	22,164	24,520	5,541	6,130
54	21,845	24,226	5,461	6,056
55	21,528	23,934	5,382	5,983
56	21,215	23,642	5,304	5,910
57	20,906	23,354	5,226	5,838
58	20,600	23,067	5,150	5,767
59	20,298	22,782	5,074	5,695
60	20,000	22,500	5,000	5,625

The values of C and E given above are taken from those given by Barlow, Rankine, Wood, and other accepted authorities.

F. E. Kidder.

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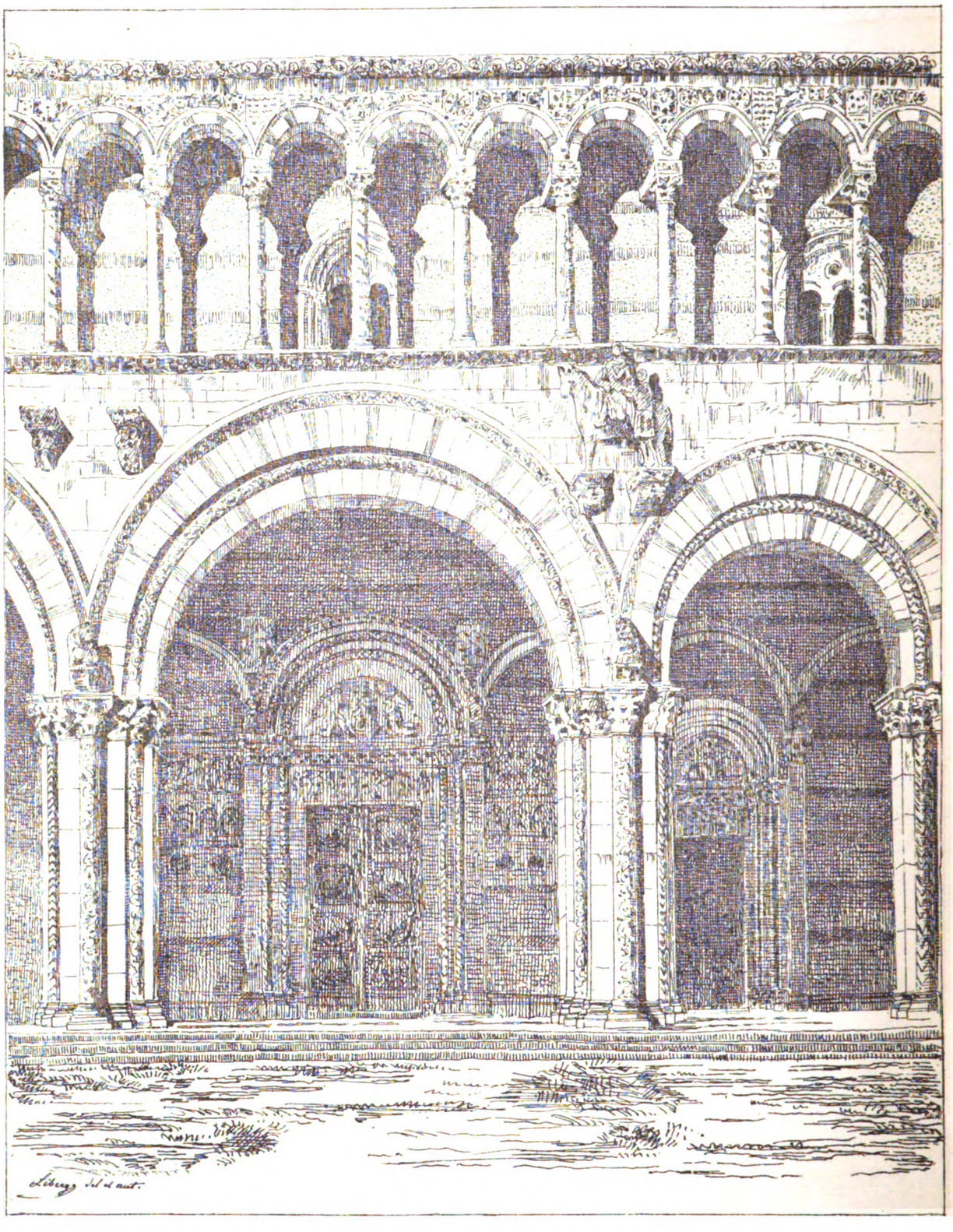

CHURCH OF S^t MARTIN . LUCCA.

Principal Façade.

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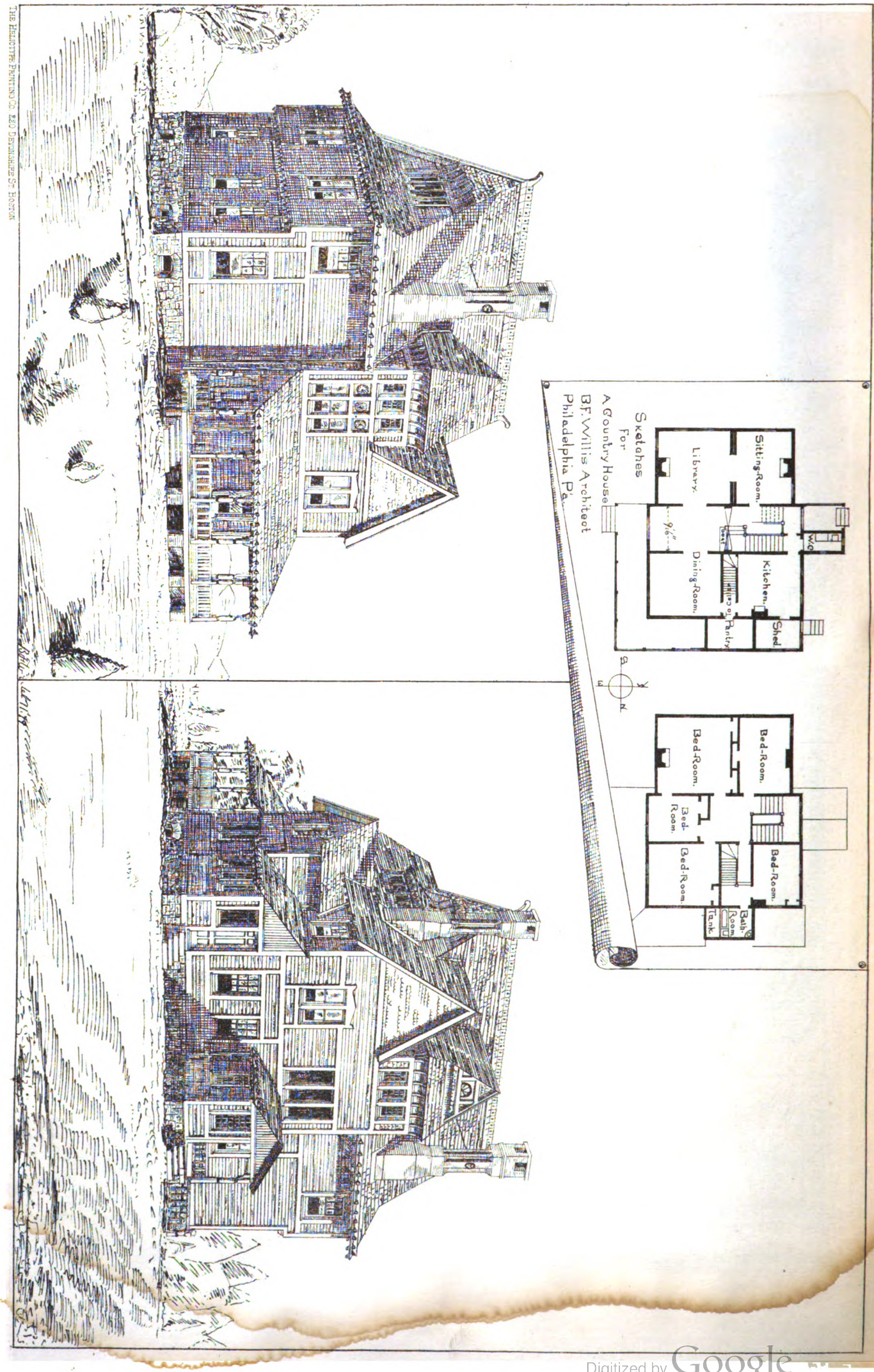

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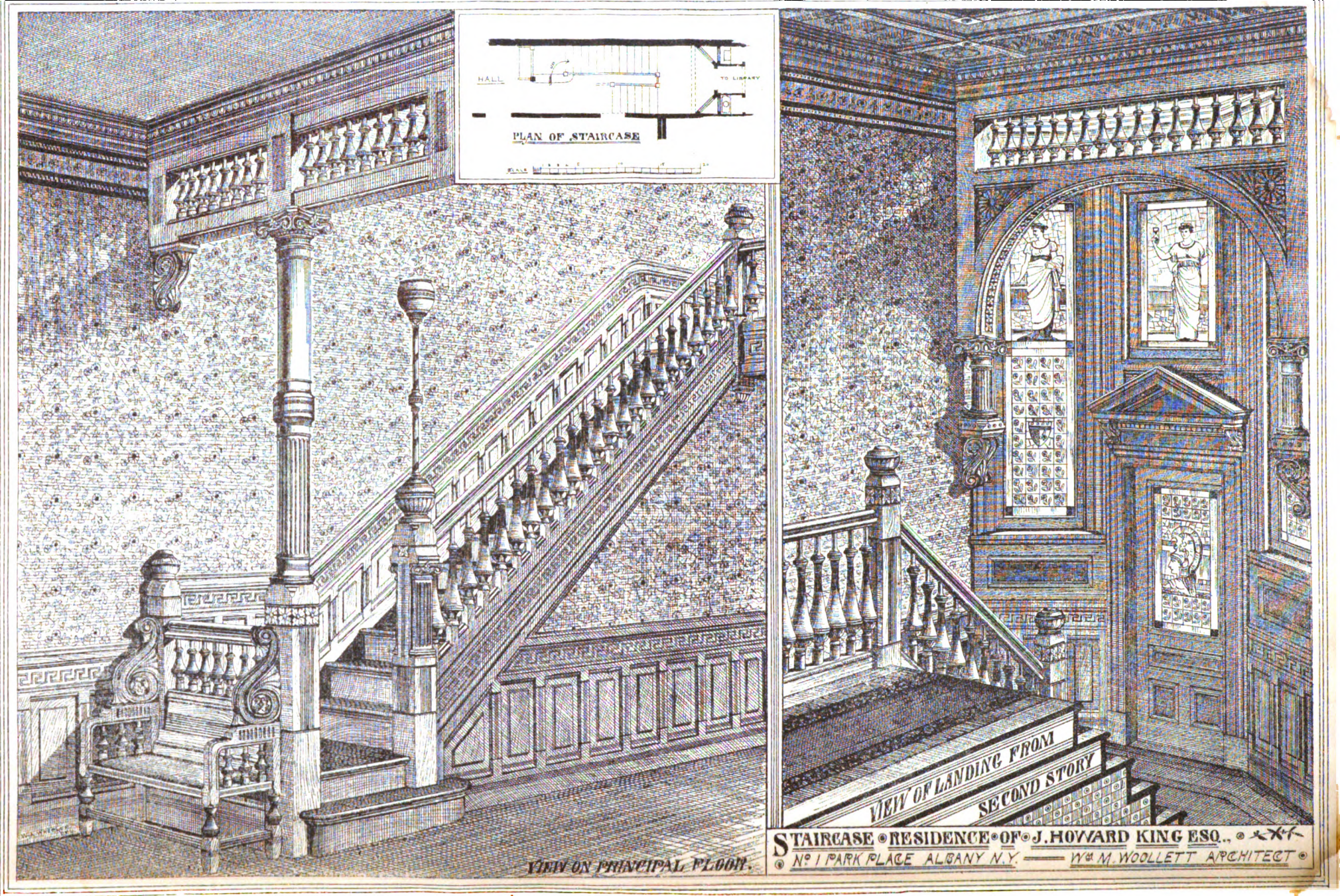

STAIRCASE · RESIDENCE · OF · J. HOWARD KING ESQ.,
N° 1 PARK PLACE ALBANY N.Y. —— Wm M. WOOLLETT ARCHITECT

THE HELIOTYPE PRINTING CO. AND LITH. BUFFORD'S SONS BOSTON

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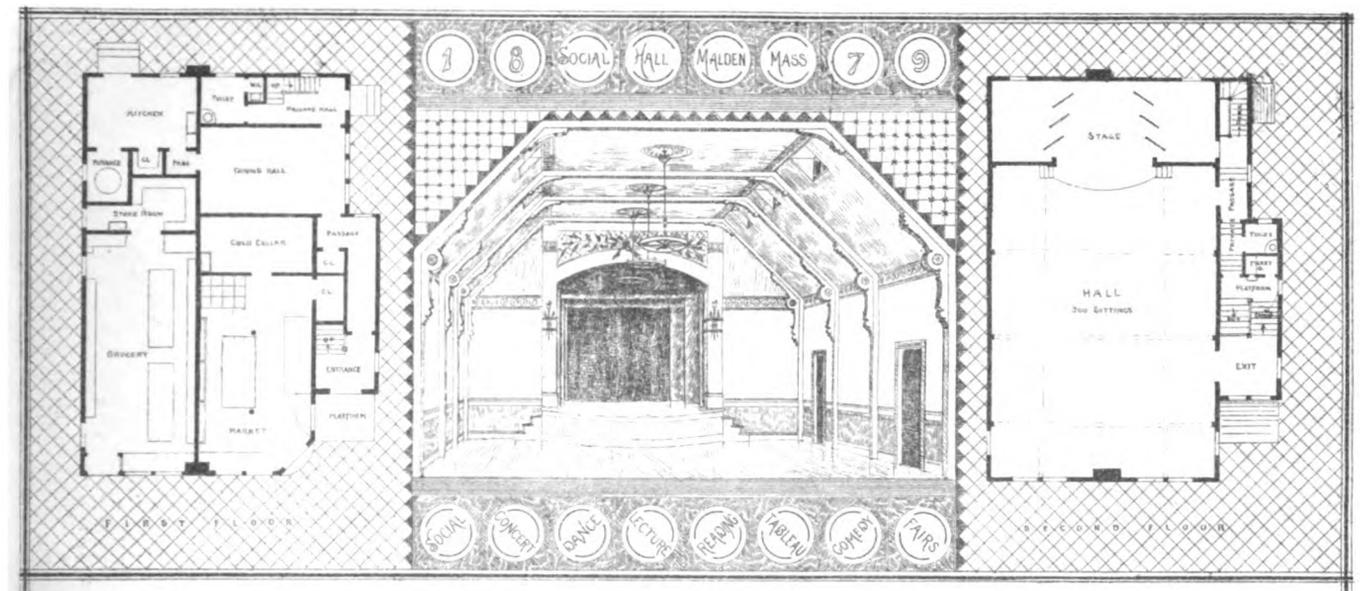

SOCIAL HALL, MALDEN, MASS.

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THE ILLUSTRATIONS.

STAIRCASE-HALL IN HOUSE OF J. HOWARD KING, ESQ., ALBANY, N. Y. MR. W. M. WOOLLETT, ARCHITECT, ALBANY.

WOOD-WORK cherry, with wall colorings in greens and gold. Stained-glass in windows on landing; ceilings of cherry, with brass ornaments.

DESIGNS FOR COUNTRY HOUSES. MR. B. F. WILLIS, ARCHITECT, PHILADELPHIA, PA.

PORTION OF THE FACADE OF ST. MARTIN'S CATHEDRAL, LUCCA, ITALY.

The Cathedral of St. Martin, of which this illustration represents the principal entrance, was built in 1060–70, in the Romanesque style, by Bishop Anselmo Badagio, who afterwards became Pope Alexander II. The principal façade was built about 1204 by Guidetto. We copy the illustration from the *Croquis* of the Intime Club.

SOCIAL HALL, MALDEN, MASS. MESSRS. KIRBY & LEWIS, ARCHITECTS, BOSTON, MASS.

This hall was built during the past summer for Alexandre Ballou, Esq.

THE RESTORATION OF ST. MARK'S.

DURING the recent agitation with regard to St. Mark's, at Venice, it has been too readily assumed that the Italians will be eager to listen to any advice we have to offer. The University of Oxford, following the example of Cambridge, has recently held a meeting to protest against the proposed rebuilding of the great façade of the Venetian cathedral. The Dean of Christ Church occupied the chair, and several speakers of influence and authority addressed the meeting. With the general purpose of these speeches we cordially agree; but we are by no means sure that sufficient care was used to avoid the danger of wounding the sensibilities of the Italian people. When, for example, Dr. Acland said that "friendly advice to friends can never be taken amiss," he surely ventured upon one of the most disputable propositions in the whole range of social ethics. Friendly advice, especially when it is offered with the air of superior knowledge and refinement, is perhaps of all human gifts the most exasperating, and its effect is even more doubtful as between great nations than in the ordinary intercourse of individuals. Moreover, as a matter of fact, we are not, as a nation, in a position to give ourselves airs upon this subject. We have done much in the way of restoration that must ever be a source of regret to those who are truly interested in the reverent preservation of the remains of ancient architecture; and, although we have lately advanced to a better understanding of what is fitting in this matter, it is surely too soon to attempt to dictate to others in a spirit of self-righteousness. The late Sir Gilbert Scott, who was entitled to speak upon this subject, has clearly pointed out that most of the errors committed by our architects arose out of an excess of zeal for the beauties of a particular style; and it is surely only just that we should credit our neighbors with motives at least as good as our own.

With these reservations, which refer rather to the manner than to the substance of the recent movement, we most heartily concur in the efforts that are being made to save a unique and noble building. The Cathedral of St. Mark may justly be described as one of the richest monuments of art and history that have survived to us; and in its preservation, not Italy alone, but the whole civilized world, is deeply interested. In the fact that by its possession Italy is favored beyond other nations we can only recognize a graver responsibility, such as all cultivated Italians would, we are assured, be ready to acknowledge. Italy is in no exaggerated sense a museum for all Europe. To such cities as Florence and Venice the students of every country must flock as to great schools and centres of art culture; and it cannot, therefore, be a matter of indifference to the thousands who have learned what such fortunate places have to teach, whether the treasures they contain are or are not to be preserved as the inheritance of future generations. If her riches were of less account, a country like Italy might, perhaps, reasonably resent the advice or interference of foreigners; but it is due to her unrivalled position as a treasure-house of beauty that, when the existence of such a building as St. Mark's is in debate, she should frankly admit to her counsels the other nations of Europe. No amount of caution can be deemed too great in dealing with a building which depends even more upon its picturesque beauty and the inexhaustible interest of its details than upon the more abstract qualities of architectural style. If the fabric is in danger, adequate means must, of course, be taken to insure its safety; but all the resources that science can command would be well bestowed in order to restore solidity to the structure without needlessly disturbing the surface of the building. There is, perhaps, no other architectural monument in the world in regard to which this particular consideration acquires greater force and urgency. The ornament of St. Mark's, bearing the record of various styles and stamped with the impress of different nationalities, could by no ingenuity of modern craftmanship be renewed or revived. Its character and beauty defy any process of imitation, and both must assuredly perish under any such comprehensive scheme of reconstruction as would seem to be contemplated. It is scarcely necessary, therefore, in this particular instance, to refer to any of the vexed questions which have lately arisen in regard to architectural restoration. Upon the general principles which should govern the restoring architect we have more than once expressed our opinion, and there is no need again to declare that we have never ranked ourselves with those who would permit a noble building to sink into decay out of an exaggerated sentiment of respect for the picturesque evidences of age. The attempt to reconstruct St. Mark's would inevitably sweep away more solid charms than those which are bestowed by the mellowing hand of time. Unfortunately upon this point there is no room for doubt, and what has already been done in the way of repairs, both within and without the building, shows only too clearly what would be the effect of anything like a complete renewal of the western façade. The curious and interesting mosaics on the ceiling of the portico could scarcely be saved; for it is notorious that when submitted to a similar process of restoration many of the mosaics inside the church have been irreparably injured.

A serious difficulty in the free discussion of this question arises from the feeling of uncertainty as to what is actually proposed by the Italian architects. The scope of the contemplated restoration is not yet clearly ascertained, and it might, perhaps, be plausibly urged that we should wait for fuller information before proceeding to memorialize the Italian people. The plea would be altogether unanswerable if it were not for the fact that all experience in these matters proves that a decision once taken is not easily changed. When the scheme in all its details shall have been finally determined, it will be practically useless to express our lamentations and regrets, while in the mean time we may, perhaps, strengthen the hands of those Italians who are themselves most anxious to avert the threatened calamity. In the introduction to a catalogue which has just been issued, Mr. Ruskin goes so far as to declare that "at this very hour committees of Venetian builders are meeting to plot the total destruction and reërection, according to their own notions and for their own emolument, of the entire west front of St. Mark's." Mr. Ruskin has doubtless earned the right to speak warmly of what concerns the fate of Venice, and his English readers, at any rate, will by this time have learned to make allowance for any imprudences of expression. But we must think that such language, coming from a critic of authority, is peculiarly unfortunate at the present moment. If Mr. Ruskin's object is not merely to indulge his own rhetoric, but to save a building which he reveres, he could scarcely have taken a more unwise course than to impute unworthy motives to those who have the question under their consideration. For it is not to be denied that the subject offers many difficult and perplexing problems. Much of the material employed in the construction of St. Mark's was not originally destined to its present use. The slabs of marble which enrich its surface, and many of the columns, had already done duty in older buildings before they were borne across the sea to Venice, and the signs of disintegration and decay which they now exhibit are such as are scarcely to be encountered elsewhere. The work of repair has therefore to be carried out under difficult and trying conditions. It is true that these slabs of marble, as stated in the memorial now distributed for signature, "have not fallen down;" but there seems to be no doubt in the minds of those who are entitled to speak with authority, that some measures of precaution are needed in order that they may not split up and fall from their places. All we ask is that these necessary repairs should be carried out with as much tenderness and regard for the ancient surface as is consistent with safety. What may be the fittest means to be adopted in order to satisfy both these objects is obviously a question that can only be decided by experts, and those who have not the special knowledge that would enable them to pronounce an opinion must be content to limit their appeal to general considerations. They can bring strongly to the notice of the Italian people the deep interest with which all cultivated minds watch the fortunes of a noble building, and they will hope in return that those to whom the delicate task of restoration is intrusted will be duly mindful of their responsibility. — *Saturday Review.*

THE SEWERAGE OF MEMPHIS.

THE following is Mr. George E. Waring's plan for sewering Memphis, which was read at the Nashville meeting of the Public Health Association, and will probably be adopted by the sanitarians now in Memphis as the best plan in their opinion: —

"In my judgment a perfect system of sanitary sewerage, for a small town or a larger one, would be something like the following: —

"No sewer should be used of a smaller diameter than six inches, because (a) it will not be safe to adopt a smaller size than 4-inch for house drains, and the sewer must be large enough surely to remove whatever may be delivered by these; (b) because a smaller pipe than 6-inch would be less readily ventilated than is desirable; (c) and because it is not necessary to adopt a smaller radius than three inches to secure a cleansing of the channel by reasonably copious flushing.

"No sewer should be more than six inches in diameter until it and its branches have accumulated a sufficient flow at the hour of greatest use to fill this size half full, because the use of a larger size would be wasteful, and because when a sufficient ventilating capacity is secured, as it is in the use of a 6-inch pipe, the ventilation becomes less complete as the size increases, leaving a larger volume of con-

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tained air to be moved by the friction of the current or by extraneous influences, or to be acted upon by changes of temperature and of volume of flow within the sewer.

"The size should be increased gradually and only so rapidly as is made necessary by the filling of the sewer half full at the hour of greatest flow.

"Every point of the sewer should, by the use of gaskets or otherwise, be protected against the least intrusion of cement, which, in spite of the greatest care, creates a roughness which is liable to accumulate obstructions.

"The upper end of each branch sewer should be provided with a Field's flush-tank of sufficient capacity to secure the thorough daily cleaning of so much of the conduit as from its limited flow is liable to deposit solid matter by the way.

"There should be sufficient manholes, covered by open gratings, to admit air for ventilation. If the directions already given are adhered to, manholes will not be necessary for cleansing. The use of the flush-tank will be a safeguard against deposit. With the system of ventilation about to be described, it will suffice to place the manholes at intervals of not less than 1,000 feet.

"For the complete ventilation of the sewers it should be made compulsory for every householder to make his connection without a trap, and to continue his soil-pipe to a point above the roof of the house. That is, every house connection should furnish an uninterrupted ventilation channel four inches in diameter through its entire length. This is directly the reverse of the system of connection that should be adopted in the case of storm-water and street-wash sewers. These are foul, and the volume of their contained air is too great to be thoroughly ventilated by such appliances. Their atmosphere contains too much of the impure gases to make it prudent to discharge it through house-drains and soil-pipes. With the system of small pipes now described, the flushing would be so constant and complete, and the amount of ventilation furnished, as compared with the volume of air to be changed, would be so great, that what is popularly known as sewer-gas would never exist in any part of the public drains. Even the gases produced in the traps and pipes of the house itself would be amply rectified, diluted, and removed by the constant movement of air through the latter.

"All house connections with the sewers should be through inlets pointing in the direction of the flow, and these inlets should be funnel-shaped so that their flow may be delivered at the bottom of the sewer, and so that they may withdraw the air from its crown; that is, the vertical diameter of the inlet at its point of junction should be the same as the diameter of the sewer.

"All changes of direction should be on gradual curves, and, as a matter of course, the fall from the head of each branch to the outlet should be continuous. Changes of grade within this limit, if considerable, should always be gradual.

"So far as circumstances will allow, the drains should be brought together, and they should finally discharge through one or two main outlets.

"The outlet, if water-locked, should have ample means for the admission of fresh air. If open, its mouth should be protected against the direct action of the wind.

"It will be seen that the system of sewerage here described is radically different from the usual practice. I believe that it is, in all essential particulars, much better adapted to the plan of sanitary drainage. It is cleaner, much more completely ventilated, and is exactly adapted to the work to be performed. It obviates the filthy accumulation of street manure in catch-basins and sewers, and it discharges all that is delivered to it at the point of ultimate outlet outside the town before decomposition can even begin. If the discharge is of domestic sewage only, its solid matter will be consumed by fishes if it is delivered into a water-course, and its dissolved material will be taken up by aquatic vegetation.

"The limited quantity and the uniform volume of the sewage, together with the absence of dilution by rainfall, will make its disposal by agricultural or chemical processes easy and reliable.

"The cost of construction, as compared with that of the most restricted storm-water sewers, will be so small as to bring the improvement within the reach of the smaller communities.

"In other words, while the system is, in my judgment, the best for large cities, it is the only one that can be afforded in the case of small towns."

THE NEW THEATRE AT GENEVA.

The curious question as to the right of the city of Geneva to make use of the munificent bequest of the Duke of Brunswick which has just arisen, as we explained last week, makes it desirable to publish the following description of the building, which is furnished by the Geneva correspondent of the London *Times*: —

The new theatre is one of the handsomest and largest structures of the sort in Europe. In beauty and extent it ranks next to the opera-houses of Paris and Vienna. In external appearance it greatly resembles that of Paris, being built in the same style of architecture, while the decoration and arrangement of the interior are as perfect as lavish expenditure and artistic taste can make them. The vestibule, which fronts the Place Neuve, is connected with the first *étage* by two noble flights of stairs with balustrades of red marble, and stuccoed, ornamented panels, lighted by splendid candelabra representing a group of children, the work of M. Carrier-Belleuse. The upper part of the staircase walls and the ceiling are richly painted: one scene, by M. De Beaumont, depicts the four seasons; another by M. Dufaux, the four elements; and M. Léon Gaud has contributed several allegorical figures of high merit. The five doors which give access to the first gallery are surmounted by busts of Plautus, Voltaire, Shakespeare, Racine, and Sophocles. The *grand foyer* (the crush-room), immediately over the principal entrance and lighted by three balconied windows, is one of the most remarkable parts of the theatre. The floor is in variegated *parqueterie*. The prevailing tint of the wainscotting is light chamois. The pillars supporting the painted ceiling are at once graceful and solid, and the gilding is profuse without being too prominent. But the *chefs-d'œuvre* of the room are the carved chimney-piece in the style of Louis XIV., bearing in the centre the arms of Geneva and surmounted by a bust of Apollo; and the mural paintings by M. Milliet, representing the comic and the tragic Muses. The auditorium is in keeping with the rest of the house. The form of the galleries, the prevailing tint (light chamois on a red ground), and the style of ornamentation are in excellent taste. The three tiers of galleries have an outward inclination, the lowest tier being in advance of the highest. The auditorium is lighted by a splendid lustre, a veritable work of art, with four hundred bronze burners. The seats are upholstered in red velvet, and the lower parts of the walls are papered or painted to match. While every precaution has been taken to prevent fires, the amplest facilities for exit are provided, and the theatre can be emptied of its occupants in a few minutes, so numerous are the doors, and so spacious are the staircases and corridors. Twenty-eight jets of water at full pressure are always ready to be directed on any point of danger, and by means of iron curtains and doors one part of the house can be immediately cut off from the rest. The cost of this splendid temple of Thespis has been defrayed from the proceeds of the Brunswick legacy, and, including the value of the land on which it is built, exceeds five million francs. It is, of course, the property of the city of Geneva, and for a year, at least, will be managed by the municipality, in order that they may ascertain by actual experience the extent to which it will be necessary thereafter to subsidize the lessee. In any case, I believe it is intended to continue the system, certainly peculiar to Geneva, of submitting the claims of débutants to the direct suffrages of the play-goers. A book is kept in which regular frequenters of the theatre may enter their names, and whenever it becomes a question of making an addition to the company the aspirant is required to perform three times, after which a meeting is called to decide whether he shall be permanently engaged or not. Players at Geneva are thus, like pastors and town councilors, chosen by universal suffrage. Judged by its results, however, this system cannot be looked upon as altogether satisfactory, for the old theatre, whether as regards the character of its plays or the qualifications of its actors, was one of the least reputable in Switzerland. But confident hopes are now expressed that the drama in Geneva will henceforth be conducted in a manner befitting its new and beautiful home.

THE WHITENING OF RED BRICK.

In an article upon "Brickwork," which appeared in No. 1287 (September 5, 1879) of the *Building News*, it was said that a white brick of a novel character — being made from red clay — will shortly be introduced to the London market from the neighborhood of the Humber. That paper now says: —

"This discovery is protected by patent, sealed March 5, 1879, granted in favor of Robert Pickwell, Esq., A. M. I. C. E., of the firm of Clarke & Pickwell, civil engineers, Hull, who was partly led to the discovery of mixing a common ingredient largely found and cheaply obtained in this country with red brick clays, by his chemical experiments upon building materials submitted to the firm by contractors for marine and other works executed under their supervision, and partly by his practical knowledge obtained in the firm's being engaged in brickmaking from the strong warp clays which so largely abound on the banks of the river Humber.

"It is a fact that certain brick earths when burnt produce bricks of a red color, whilst others produce, under the action of fire, bricks of a white or buff color; but the chemical character of these clays has been little considered, and with the exception of incorporating therewith cretaceous matter, nothing had been done in the way of altering the composition of our various red clays until Mr. Pickwell took the matter in hand. For some years it has been patent to this gentleman, that, with the mechanical appliances now brought to bear upon the trade, an attempt to deal with the composition of the brick-earths might reasonably be made, and that the material wanting in the red brick clays to enable them to fire into white bricks might, in a pure or concentrated form, be readily and cheaply added. This, as experiments upon a variety of red clays proved, required but the intermixture of a common ingredient, the cost of which in a dry state varies with locality, but on the average ranges about 12s. per ton. Its action, we may state, is to flux with the iron so largely present in the red clays, and to render it inoperative in coloring the bricks.

"The process of making and burning these patent bricks in no way varies from the ordinary mode; but the intermixture of this dry composition renders clays of a strong character sufficiently dry to work in Matthew's and other brickmaking machines, which is not possible with them in a natural state. The mixing of the clay with this ingredient is the most essential detail, and this is done by an appliance constructed for the purpose, the cost of which is very nominal, and which in most establishments where steam-power is employed would entail but little addition to the existing machinery. Another and a great advantage is that the red clays, which in this case are merely wanted as a basis, do not require to be of that fine quality neces-

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sary in making best red bricks, and a commoner class of material, when submitted to this mechanical treatment, will serve to produce best quality white or yellow bricks; and lastly, the fact of the largest and best deposits of clay in the country, which are well known to be red in color, being placed at the disposal of the makers of white bricks, is an advantage the estimate of which we cannot reach.

"The discussion of these details brings us to the following considerations touching our natural deposits of white brick earth. This earth is sparingly disposed throughout the country, and it is rarely found incorporated with the requisite amount of bleaching material. If too weak in this composition, the bricks will burn pink in color, and if too strong they suffer in hardness and in their bearing qualities, and become tender and rotten in their texture. Where red clays are made the basis, and the mixture is wrought by artificial means, the point of perfection can be easily reached and rigidly maintained. It is a bold assertion to put forward, that artificial brick-earths can be worked with more perfection than natural ones; but, nevertheless, the assertion holds good in the majority of cases.

"With the bricks under notice, the questions of durability, persistence of color, and other details do not arise, if perfect mixture of the bleaching material and burning apart from red bricks are observed, as the material, in its perfected form, is identical in character with the best beds of white brick earth found throughout the country.

"Messrs. Clarke & Pickwell have put down a large plant for the manufacture of these bricks at New Holland, on the southern or Lincolnshire bank of the river Humber, where rail and water communication of the first order exists, and they are now fairly at work manufacturing white bricks from the local warp or red brick clays, a sample kiln of which was drawn on the 5th inst. in our correspondent's presence. These works are being taken up by the 'Patent White Brick Company, Limited,' who have bought the exclusive patent right over an area the radius of which extends sixty miles from the works. In this radius the company holds the exclusive right of granting licenses to work the patent, and the patentee is commencing active operations in connection with the letting of other districts, as our advertising columns indicate.

"The patentee has strongly tested his invention in commencing operations on one of the strongest and most ferruginous deposits of clay in the kingdom, and it is clear, if he can successfully produce good white bricks from this material, that his task in applying his invention to milder and lighter clays is an easy one.

"As to the opening offered for the sale of these bricks in the neighborhood of the works, it may be noted that the red bricks of local manufacture are vending at 28s. per thousand, whereas white bricks, which have to be brought a considerable distance, are rating at 50s. This disparity of cost, from the extreme rarity of good white brick earth, is by no means peculiar to the Humber district, and this fact goes far to prove the useful character of the invention and to argue its general application.

"Such, then, in brief, are the particulars of this new discovery in brick-making, and from the reports which have reached us we are led to anticipate its general adoption in districts where red brick or inferior white brick earths exclusively prevail."

THE LAMP OF TRUTH.

ONE reasonable view of the "graining" business is set forth in a homely but convincing way by the following anecdote, which we extract from an exchange paper.

During the past summer one of Charlotte's German residents came to Rochester for lumber to finish a house which he had built in the former place. He gave the matter his personal attention in order to get the best material in the market. He spent several hours in picking out the choicest boards, and, after paying a good round price for the same, mounted his purchase and proceeded homeward. After the lumber was cut and sawed, and put in position pleasing to his eye, he engaged a painter to put on the finishing touches. Being called away on business matters for a day or two, the German left instructions with the manipulator of the brush to do the painting in a manner consistent with the material to be decorated and to make a first-class job. Business matters adjusted, the German returned to the spot uppermost in his mind to inspect the progress made during his absence. The artist, intent on pleasing, had almost completed the work after his nicest designs of oak imitation. The German took it in at a glance and approved of the business in a manner little anticipated by the painter. "Mein Gott, feller! Vat der h——l you make of dot knots und stringy peashness for doze blanks? You tink I vas a fool und make of myself mit a lumber pile von whole day, and bay four exdra dollars mit a hundred feet for doze nice poards mitout knots, und den pring you here mit your rags und iron combs und tings, und bay you tree dollars a day to put knots in 'em? Not py a tam sight; if I vant knots I puy knots tammed scheap. Gone avay quick." The artist, accompanied by his kit, went out astride the violin-box hung at the end of the Dutchman's leg, and that vicinity knows him no more.

"THE LAND OF HEALTH."

DR. BENJAMIN RICHARDSON, who four years back delighted the Social Science Congress at Brighton, in England, by his marvellous sketch of the imaginary Hygeia, the "model City of Health," drew for the recent sanitary congress at Croydon an equally enchanting picture of the healthful country of Salutisland. In this ideal realm sickness and sorrow are all but unknown. The inhabitants lead Arcadian lives under sanitary conditions so perfect that none die before their hundredth year, while many add a sixth score to the century, and, on their 120th birthday, meet death with the welcome due to a friend who arrives at the appointed hour. For in Salutisland, the dark king is stripped of his terrors by a wholesome life extended to the utmost natural limit. Dr. Richardson, with scientific care, has banished from the bright region created by his fancy all the forces and agencies that sap vitality before it is ripe. There are no lawyers, for contention is unknown. Physicians find limited tolerance as "professors of sanitary science and preventive medicine." No city in this blissful country is permitted to exceed a population of one hundred thousand, or to dispense with embowering gardens and wide tree-shaded streets. The houses stand on arches, so that a free circulation of air is secured on all sides. The living-rooms are separated from the bedrooms. There is a garden to every dwelling. Even the roofs are beautified by flower plots. The people of Salutisland recognize the right of the inferior animals to life. No creature dies that man may dine. Cows are kept for their milk, and sheep for their fleeces. All personal transit is done on horseback or on the bicycle, railroads being employed only for moving heavy goods. Not more than three hours in each day can be spent in toil. The taxes are of the lightest, for Salutisland possesses neither army, navy, nor diplomatic service. When laws are to be made or changed, the legislators retire to some inaccessible spot "amid dry rocks on a mountainous range," where business is likely to be transacted with the least disturbance and the utmost speed. Thus, the fortunate Salutislanders pass serene lives, free from passion or trouble or toil, and are carried forward to the "anatomical limit of life" by the most consummate sanitary arrangements which Dr. Richardson's trained imagination can desire. Evidently, modern science holds, with Sidney, that the best ingredients of health and long life are

"Great temperance, open air,
Easy labor, little care."

Boston Herald.

KANSAS NATIVE OR UNBURNT LIME.

AMONG the natural products, some of them possessing very peculiar characteristics, which the young and growing State of Kansas contains, is a singular substance, lying in very considerable beds, and called "Kansas native lime." It is of a beautiful white color and of a very fine-grained texture. It is soft, smooth, and readily made into a plastic condition by the admixture of a suitable quantity of sand and water. The mortar thus made up has seemingly identical qualities to the best mortar as made from superior limes selected from kilns where the lime rock which had been employed for burning had been of the very purest nature.

The native lime is a sort of whitish and pure white clay, lying disposed favorably in beds more or less horizontal in their position. These beds are seen to be outcropping along the borders of certain streams and in the breaks of hills, and in such places the beds can be worked entirely above the water level. Experiments which have been performed by workmen and artisans in Kansas have exhibited the fact that the Kansas native lime mortar serves as good purposes as any other usual styles or kinds of mortar, and even better than some of the artificial mortars, especially for nice inside work. The tendency of this newly discovered deposit of pseudo-lime, when made into mortar for walls and stone-work or plastering, is to soon set and harden. Another remarkable quality then noticed is its turning immediately to an intense whiteness. The beds are very thick and easily dug; so that large quantities of the substance can be thrown up, and at once applied to use. Beside its ready adaptability to purposes of mortar, it has also been applied to the purposes of whitewashing, and in this respect it has been accepted as an admirable substitute for lime prepared artificially. These immense beds of pseudo-lime occur in localities where railways of eastern Kansas can readily be utilized for shipping the material to all parts of the country. It is, perhaps, presumable that upon the spread of the knowledge of this fact, the excellent natural mortar-lime and whitewash-lime from these native deposits may become articles of export, especially as improved styles of building and more permanent structures everywhere in Kansas, Missouri, Nebraska, Iowa, and Illinois are growing to be more and more the requisites of the times. The great pseudo-lime beds or native beds of calcined lime rock are a geological phenomenon. They are difficult to account for in any plain or obvious manner. They have a close resemblance in their physical condition and looks, and in their feel or touch, and in their action when mixed to form mortar, to the best mortars made in the usual ways with the very best of limes. Can it be possible that some of the unknown laws of electro-magnetism and of terrestrial magnetism, which cause certain metamorphisms to occur in metalliferous beds, are likely to be discovered as the laws also which set the elements at work to alter the chemical conditions of this singular lime-rock stratification? Can the problem of their origin and nature be clearly or satisfactorily accounted for in any other way? Does such a strange product as this occur in any other section of our continent? ††

THE ST. LOUIS SUB-CONTRACTOR'S SIGN.

ST. LOUIS, December 5, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — Your St. Louis correspondent must plead guilty to the charge made by "Junior," in your issue of the 29th ultimo, that he did not notice the objectionable placard described by "Junior" in a former letter, and did not intend to notice it; moreover, that he has not seen nor heard of any one else who has noticed it, save your correspondent "Junior."

The senior member of the firm of architects which has control of the building apparently referred to by "Junior" is one of the oldest and most successful architects in this city, having erected a greater number of fine buildings, probably, than any one else, and

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enjoying at present much the largest practice in St. Louis. He is therefore not likely to need sympathy nor counsel, nor to be at all deficient in ability to take care of himself.

Very respectfully, C. E. I.

NOTES AND CLIPPINGS.

A $10,000 Verdict for an Architect. — The long litigation over the claim of Mr. J. A. Vrydagh against Vigo County, Ind., terminated December 6 in a verdict for the plaintiff for $10,425. Mr. Vrydagh's plans for a $200,000 court-house were adopted seven years ago, but the citizens of Terre Haute enjoined the Commissioners from going on with the work, and the architect sued on his claim, with the above result. The case was on trial for a week in Greencastle.

Churches in Chicago. — The great fire in Chicago in 1871 left standing, we believe, but a single church in the whole city; yet such have been the spiritual need and the enterprise of the citizens that there are now, according to a recent enumeration, two hundred and thirteen churches in the city, besides about twenty missions and eleven Adventist and Spiritualist societies. The Roman Catholics have thirty-five churches, the Baptists twenty-four, the Evangelical Lutherans twenty-four, the Methodists nineteen, the Presbyterians eighteen, the Episcopalians, Congregationalists, and Hebrews each ten.

The Organ for the Stewart Memorial Cathedral — The organ which is now building for the Stewart Cathedral at Garden City, L. I., is in several respects one of the most remarkable instruments in the world. It will be placed in four different parts of the building, the organist sitting at a key-board in the chancel and playing all four parts at once by means of electrical connections. There is also an echo organ in the roof, which can also be played from the chancel, and the chime of bells in the tower will at times lend its voice in the same way. In spite of the necessarily complicated nature of the mechanism, the adjustment of all the parts is so perfect that no greater pressure is needed upon the keys than in playing a piano. The organ will have some one hundred and twenty speaking stops, which are thirty-six more than in the great organ in Boston Music Hall, and nine more than in the huge instrument in Albert Hall, London. Five hydraulic engines will run the organ. The cost of the instrument will be some $40,000.

Mississippi River Improvement. — The Mississippi River Improvement Convention, which was held in Quincy, Ill., a few weeks ago, adopted a resolution instructing its president, ex-Governor Stanard, of St. Louis, Mo., to appoint an executive committee to prepare a memorial to Congress setting forth more in detail the views of the convention upon the subject of the improvement of the channel of the Mississippi River and tributaries, to collect and publish statistics bearing on the subject for the information of the people and government, and to use all further means to procure early and favorable action upon this subject by Congress. In accordance with these instructions, Mr. Stanard has just appointed the following named gentlemen as the committee: J. Ham Davidson, St. Paul; Charles Seymour, LaCrosse; M. T. Johnson, Galena; Robert F. Bower, Keokuk; John A. Scudder, St. Louis; John Bofinger, St. Louis; S. F. Covington, Cincinnati; Enoch Ensley, Memphis; Jos. H. Oglesby, New Orleans. Mr. Stanard is also a member of the committee.

Illicit Commissions. — A case (heard in the Lambeth County Court before Mr. Pitt-Taylor) was lately brought for the recovery of a balance of commission, and is reported in the *South London Press*. Plaintiff is described as a draughtsman, carrying on business at Norfolk Street, Strand; defendant is a builder carrying on business in Beresford Street, Walworth. The claim was for £4 15*s*., balance of an account for commission. Plaintiff, it appeared, had had placed under his control five dilapidated houses situate in Broad Street, Lambeth. Plaintiff had also the option of employing any builder he saw fit to carry out the necessary repairs. Plaintiff and defendant had some conversation on the subject, and plaintiff asked defendant what percentage he would allow him in the event of his obtaining defendant the job. Defendant said he would allow him five per cent. Plaintiff complained that that was a small percentage on a £200 job, but agreed to obtain it for him on those terms. The contract was obtained by the plaintiff for defendant, and amounted with extras to £215. Plaintiff then claimed his commission, £10 15*s*., but defendant refused to pay more than £6 of that amount. This sum had been paid to the plaintiff, and he now sought to recover the balance of £4 15*s*.

The Judge (to plaintiff). — It is my duty to tell you that you have committed a gross fraud, and you may consider yourself fortunate you have not had to appear before a magistrate. A gentleman engages you for the purpose of obtaining a builder at the cheapest rate, but instead of doing so you make the best bargain you can for yourself. It is a gross fraud, and you ought to be ashamed of yourself; so get out of the court as soon as you can.

Judgment for defendant, with costs of solicitor.

The Cost of Theatres. — A German return which has been lately published gives the following interesting particulars of the cost of building some of the leading Continental theatres. The Stadt Theatre, at Leipsic, built in 1868, cost, altogether, $419,110. The Court Theatre, at Dresden, which was burnt down, and which was built between 1838 and 1841, cost $395,970; and the present theatre, which took from 1871 to 1878 to build, cost $1,075,000. The Théâtre du Châtelet in Paris, built between 1860 and 1862, cost $685,000. The Comic Opera House, in Vienna, built between 1872 and 1874, cost $418,500. The Théâtre Lyrique, in Paris, built between 1860 and 1862, cost $449,560. The Imperial Opera House, in Vienna, which took from 1861 to 1868 to build, cost, altogether, $2,700,000. Finally, the Grand Opera, in Paris, the building of which occupied from 1861 to 1875, cost $8,000,000. — *Continental and Swiss Times.*

Who was Terra-Cotta. — The Providence *Press* tells of a lady in that city who, after attentively examining a bust in a window, eagerly inquired, "And who was this Terra-Cotta, any way?"

The Famous Aztec Ruins at Palenque. — M. F. Maler describes in *La Nature* some important results obtained by him in a recent visit to the famous Mexican ruins of Palenque. Taking the Palace of the Kings for his point of departure, he made excursions in all directions. He came upon innumerable heaps of stone, the last remains of once solid monuments. He found hundreds of houses, partly standing, partly demolished; small bridges; aqueducts, in which even now the water flows so fresh and pure that M. Maler and his companions could not help taking a drink from it. The number of temples and palaces still standing on their pyramidal bases, more or less great, is (counting the large Palace of the Kings, with its tower, as a single edifice) exactly a dozen. The result of M. Maler's researches relative to the great extent of the ruined city, especially in an east and west direction, is quite in accordance with the accounts of the oldest explorers. He only disagrees with those modern explorers who, having only visited the buildings situate close to the Royal Palace, without penetrating further into the almost impenetrable forest, have cast doubts upon the abundance of the ruins. M. Maler describes in detail one of his new discoveries, — a temple hitherto ignored, which contains in its sanctuary a mysterious sculpture, with a figure of a cross, affording much food for thought to American archæologists. To give an idea of the incredible thickness of the forests in these wild places, M. Maler states that the temple is at no great distance from the centre of the ruins, being quite close to the Temple of the Cross (known long ago) and the Temple of the Trophy. These three temples are situated at a short distance from the Royal Palace, towards the southwest, that is, in the direction of the Cerro Alto del Palenque, with their façades towards a little triangular space, of which they occupy the three angles. They are built on an almost identical plan, which may be called the typical plan of the temples of Palenque. Each of them is raised on a pyramid, which, in the case of each of the temples already known, is detached on all sides, while in the case of the newly-found one it rests against the slope of the Cerro Alto. The distance of one temple from the other did not appear to exceed 150 metres, and of the commencement of one pyramid from another not fifty metres. On the platform of the pyramid, at a length of perhaps forty metres, rises the newly-found temple, which, from its base to the verge of the stone roof, does not exceed a height of eight metres. It is built entirely of calcareous ashlar, dressed along the edges. The façade or external part of the vestibule, once formed, like the two neighboring temples, by four pillars which support the stone roof, has, unfortunately, already yielded to the sad work of vegetation, which is to be regretted, as the pillars were generally ornamented with superb figures in stucco richly painted. The bottom of the sanctuary in the central chamber is adorned with sculptures, the most curious at Palenque. They are executed on three slabs of calcareous stone of one metre eighty-one centimetres in height, by two metres eighty-nine centimetres in total breadth. The two pillars which support the vault of the sanctuary were formerly, as in the other temples, decorated with sculptured figures on large slabs of calcareous stone, which, unfortunately, have disappeared. Some fragments of these figures, representing richly vestured personages, still lie on the threshold. The sculpture at the bottom of the sanctuary is still perfectly preserved and quite visible, notwithstanding its feeble relief. On a species of pedestal rises a cross, of a design even more striking than that of the neighboring temple, so well known. The cross is surmounted by a strange head, bearing on its neck a collar with a medallion. Above the cross is seated a bird with a hieroglyphical head; to the right, a man is placed on a graceful leaf ornament. This personage is not habited in the manner of the great lords of Palenque; he represents, without doubt, one of the people, as does the woman on the opposite side; the latter holds in her hands an offering. Both man and woman have the mouth open, as if speaking. Four rows of katun (or magic writing signs), on the right and left of the group, contain, no doubt, the legend as to the worship to which the temple was dedicated and the epoch of its foundation.

The Open Air Theatre at Oberammergau. — The Commune of Oberammergau has built a new theatre for the representations of The History of the Sufferings and Death of Jesus, which will be given in the famous valley next year. The part for the spectators will accommodate between five and six thousand persons. Exactly as in the great theatre built for the Wagner festival at Beyreuth, the orchestra will be placed quite out of view of the spectators. The number of persons who will be engaged in the performance, including children, will be between six hundred and fifty and seven hundred. Of these, nineteen will be actors and solo singers. The orchestra will consist of thirty performers. Almost the entire population of the city will have some share in these gigantic representations.

What a Fire Insurance Policy does not Cover. — Fire insurance policies do not include in their indemnity, among other things, the following: Fences and other yard fixtures, also store furniture and fixtures, and plate-glass doors and windows, when the plates are of the dimensions of three feet or more. It is important that this fact be mentioned in the wording of the policy, if such articles are to be included under the policy. If a building falls, no insurance will attach, or cover its loss, unless it is caused by fire. Losses from explosions are not to be paid unless fire ensues, and then only the actual fire loss is to be settled for. The assured, in case of a fire, must invariably do his best to save it, and carelessness in this respect will vitiate his claim. In no instance shall he abandon his premises to firemen or thieves. — *Philadelphia Insurance Reporter.*

The Baltimore Aqueduct. — A Philadelphia paper states that the great subterranean aqueduct which is to supply the city of Baltimore with water is almost completed. It is twelve feet in diameter and very nearly seven miles in length. By means of a dam across the Gunpowder River at Lock Raven, twelve miles from the city, the water is turned into the tunnel and carried to Lake Montebello, seven miles distant, where it is discharged into an immense natural basin, which has been paved with brick and cemented, so as to answer all the purposes of a reservoir. From this basin the water will be distributed to the supply-mains of the city, five miles distant. The tunnel cost $1,500,000. It was commenced in 1876.

A Model School-House. — At Perkinsville, Vt., is building a school-house, the cost of which will be between $16 and $17.

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THE Commissioners of Education of the city of New York lately appointed a special committee to consider the reorganization of the service of maintaining the city school-houses, which is under their charge. The first recommendation which the committee made in their report was that a supervising architect should be appointed to make plans for new school buildings as they were needed, that not being part of the duty of the Superintendent of Buildings, whose business it was simply to keep the existing ones in repair. One of the commissioners thereupon declared that the Board needed no architect, that his salary would be thrown away, and that the twenty-five hundred dollars demanded for it would pay the schooling of one hundred and sixty primary-school children; and, citing a school in Seventh Street, which the superintendent had planned, defied any architect to make a better school building. With these assurances, the Board decided not to have an architect. Now of the excellence of the Seventh Street school building we know nothing, but we think our readers' credulity will hardly stretch to the belief that no architect could build a better. If it really warrants this belief, it must at least be singularly different from the other school-houses of its native city, and we fancy that our enterprising fellow-journal, the *Sanitary Engineer*, will be mortified if its promised competition proves only that no advance is possible beyond what the Board superintendent has already accomplished. The argument of an alternative use for the salary is a familiar one, and a universal favorite, being applicable to all cases alike. The mayor's salary, for instance, would educate still more primary scholars. It was not made to appear, however, that if the twenty-five hundred dollars were spent on an architect any one hundred and sixty scholars would have to be left unprovided for. Private individuals have found it to their interest to have their architectural service, like their other special services, performed by persons who made it the special business of their lives to know how to do it, rather than by superintendents. Other cities have found advantage in appointing school architects and municipal architects. The school boards of London and of many English towns have their architects, to the benefit of their buildings. Boston has its city architect, and this has brought about a notable improvement in her school-houses, the building of which has been his chief duty. We do not know what might happen in New York if the office of architect to her Commissioners of Education should get into politics; but as far as economical reasons go we really think so rich a city might afford to risk twenty-five hundred dollars in an experiment, to see whether the skill of a capable architect could not make some improvement in the series of school-houses whose scandalous condition has made her notorious throughout the country.

WE print elsewhere a letter which presents one phase of a question that we have several times discussed under other aspects, — that of the rights of an artist in the studies which he makes for works which are ordered from him. A sculptor made to order a portrait bust. It was cut in marble, and he incautiously left the plaster from which it was cut (the cast from his clay model, we presume) in the shop of the marble-worker who did his cutting. The client took advantage of this negligence to order a second copy in marble from the stone-cutter, which was made without the knowledge of the sculptor. To the sculptor's protest that this proceeding injured him in two ways, — by the unauthorized use of the plaster model, which was his property, and by reproducing his work without his supervision, — the client answered that the model was not the sculptor's property, but his own, and that the sculptor was not injured by the reproduction, because his name was not put upon it; nor had the name a right to be there, inasmuch as the *replica*, like the model, was the client's property, with which the sculptor had no concern. The sculptor, on the other hand, claims remuneration for the use of his plaster, and "the right to pronounce as to the merits of its second reproduction."

As to the likelihood of enforcing a legal remedy in such a case as this of Mr. Bartlett's, that is a question for lawyers. But there are some points in the case which are clearly covered by prevailing usage, and there are others in which the right and wrong are easy to discern, whether the legal remedies are so or not. Two distinct questions are involved: that of the ownership of the plaster model, and that of the right to make copies. As concerns copying, no analagous American cases have come under our notice; but it is our impression that the latest English decisions are that the right of reproduction goes with a work of art when it is sold, in default of any stipulation to the contrary; and we should expect to see an American court take the same ground. From this understanding it would seem unlikely that the purchaser of a bust could be prevented from having copies made of that which he purchased, except by previous agreement. In the case presented here, then, we do not see that the client could have been prevented from copying the marble, for which he paid; but his right to copy the plaster would depend on the other question, whether that belonged to him or to the sculptor. But there is another side than the legal one to this question. It is an almost universally respected usage to go to the artist himself whenever a copy of one of his works is desired, because this is, as it were, a debt of honor to the artist, whose idea and skill give the *replica* its only value, and who has furnished it for a single use, and not for several; because, also, he is the person who can best insure that the copy shall have the qualities of the original, and his approval is the only one that is an adequate endorsement. Popular sculptors, like Mr. Powers, and Mr. Jackson, whose death we but lately noticed, have owed a great part of their proper remuneration to the many *replicas* they have made of their favorite works, by which, moreover, the knowledge of their work, and therefore their reputation, has been greatly extended. But an unauthorized copy is liable to injure an artist's reputation by representing him falsely, if it assumes to represent him at all; while if, as in Mr. Bartlett's case, his name is withheld, he is deprived even of the legitimate extension of his reputation due to whatever praise it may bring. To most considerate persons either argument would be sufficient: that the *replica* made without the artist's supervision will be inferior to the original; or that it is an offence against comity, at least, to deprive him of his share of the benefit of the reproductions. When a client is inaccessible to either of these arguments, we do not know that there is any protection for the artist except in copyright.

To return to the ownership of the model. We may assume that the client here ordered a marble bust, and not a plaster one; from our correspondent's account it is clear that the marble one was that which was delivered and paid for, and that the plaster was not delivered at all. It does not appear that the client either asked or paid for two busts, and, unless there were something in the negotiation which is not explained in Mr. Bartlett's letter, we see no more reason for setting up a claim on the plaster than on the clay model which was destroyed in making the cast. The case is of general interest, because it is only a special case of the general principle that the preliminary studies, draughts, and models which are an artist's means of arriving at the result for which the client pays his architect, sculptor, or painter are only the artist's tools, with which the client has no concern, except so far as they are the means, when they are exhibited to him, of securing his approval of the intended result. They are made absolutely and only for the service of the artist, and if he could and should do his work

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and explain his intentions without them his client would have nothing to say in the matter. Under these circumstances, in the absence of any legal enactments, only an established usage could give the client any right to them. But the usage is all the other way. The painter does not give up his sketches when he makes them, except by special agreement; the architect does not give up his working plans, nor does one client in a hundred think of claiming the ownership of them; and this is not a local but a general rule, the world over. So far as we know, sculptors always keep their plaster models, as they would keep their clay models, if these did not perish in the using. The usage is as well established and as decisive in these arts as is the habit of the lawyer of filing away his briefs, or the minister his sermons. It is not so well understood only because people are not so well used, especially here in America, to dealing with artists as with lawyers and the clergy. It is but a small part of the community that ever orders pictures or sculptures of the artist who makes them, or employs an architect to build houses, and a majority of those who do these things do so for the first time. The usages of such transactions are new to such persons, and the reasons for them unknown. It is much safer, therefore, until the public is better informed on these matters, and will be a means of avoiding many controversies, for the artist who does not wish to waive his rights — and it is better, in the interest of his profession and of the general peace, that they should not be waived without special notice that they are rights waived — to make sure that his client understands them from the beginning; or at least that no opportunity is given him to disregard them, and no encouragement to misconceive them.

A singular case in architectural practice has just been brought up in a London court, as we learn from the *Architect*. A Mr. Brede, architect, had made a preliminary survey, contract drawings, and specifications for a new workshop, to the order of Mr. Dickens, boot-maker. The client, demanding no further service of his architect, got tenders from several builders for the work, and, though the lowest was below the architect's estimate, decided not to accept any of them; but found a builder who, furnishing his own specification, and substituting it for the architect's, built the workshop according to it at a cost below any of the tenders, and without the superintendence of the architect. When the architect presented his charge at the accustomed rate of two and a half per cent for such service, the client refused to pay the whole amount, alleging that he had used the builder's specification, and not the other, and therefore was not bound to any payment for the architect's specifications, but only for his drawings. Hence the suit. The judge in his decision strangely sustained the position of the defendant, and docked the charge for specification from the plaintiff's bill, allowing him four guineas for his fee and the costs of his suit. On what the award of four guineas was based is not shown in the report; but the original two and one half per cent demanded amounted to about thirteen guineas.

It is not surprising that the plaintiff took an appeal to a higher court. If such a decision as this were sustained, and the logical deductions from it applied generally in practice, the way of architectural business would be a rough and thorny one. The case, like most of those which come up in an architect's dealings with his clients, rests, in the absence of enactments for it, in equity and usage. The principles which should govern it are substantially those which we have cited in the preceding paragraphs. And the error in the judge's mind, as we must conceive it, was that which is common among persons who pass judgment *a priori* on an architect's relations without due study of the facts and conditions of his practice. It is ignorance of the principle established in ordinary usage that, unless by special agreement to the contrary, the architect, like any other professional man, is paid for his service, and not for the implements of it, which are his drawings and specifications. The implements may in particular cases be transferred to the client; ordinarily they are not. This principle being the basis of practice, and generally acquiesced in by clients, it follows that the service having been received by the client payment is due for it, whether the plans and specifications which are the incidents of it are used or not. On no other understanding could architects afford to practice. There are those now and then who will make their plans and specifications on approval, not to be paid for if not used, as there are some lawyers who will make their fees contingent upon a successful suit, and a certain class of physicians who advertise "No cure, no pay;" but such conduct is as unprofessional, and as bad in its results, in the one case as in the others. In the instance before us, to refuse payment on account of the specification because another was substituted is like refusing to pay a physician's fee because the patient did not choose to take his prescription. The right to do so includes the right to refuse payment on account of the plans, if they had not been followed, — the right, that is, to refuse all payment to the architect whenever the client decides not to build according to his designs; for we can see no possible reason for discriminating between plans and specifications in this respect. Such a doctrine would place architects under a disadvantage which no other class of men have to endure; if practically applied, it would be ruinous to their profession. It has never been applied, but it is the logical outcome of this decision. The inevitable inference is, so far as we can see, that any man may go to an architect, may order him to make plans and specifications, and bring everything to the point of signing a contract, and then, if he chooses to desert him, go his own way, and have nothing to pay.

There is hardly a place in Europe dearer at once to the lovers of architecture and the lovers of the picturesque than the town, or rock, of Mont Saint Michel on the coast of Normandy. Certainly we know of no such striking combination of architecture and site as this grand and orderly conglomerate — crystallization, we might almost call it — of steep rock and lofty wall, enclosing town and abbey, and crowned with its florid fifteenth-century choir and tower, rising superbly four hundred feet out of the sea at the end of the long sands which at low water connect it with the main-land. In late generations, the town has been almost sacred to sight-seers of the more enthusiastic class, being remote from railways, and to the handful of fishermen's families who still live there. But now a company has been formed for its improvement; a dyke and a railway are to be led out to it from the shore, a harbor to be enclosed, and the town reclaimed for the practical uses of modern civilization. The friends of its picturesqueness have taken alarm, for already the company has attacked its famous walls, wonderful ramparts of the fifteenth and the three preceding centuries, and it is feared that irreparable mischief will be done to its beauty. Those who love *this* beauty may mourn the loss of the restorer of the walls of Carcassonne and of Pierrefonds, M. Viollet-le-Duc, whose energetic voice would surely, we think, have been lifted up to restrain, even if the concessions of the government have made it impossible to prevent, the injury done to this wonderful monument.

A more judicious resolution than those on the same subject which have preceded it is that introduced into Congress by Mr. Acklin to authorize the President to appoint a commission of five engineers (two from the army, one from the navy, and one civil engineer) to inquire into the need and the best route for an inter-oceanic canal. Mr. Acklin wisely took the ground that, though such a canal was to be desired, it was not clear to himself, and probably not to his fellow Congressmen, which was the best route for it; and his resolution provides that the commission shall examine all the surveys and report fully upon them to Congress. At the last meeting of the Geographical Society, Colonel Myers read a paper by Admiral Ammen, recapitulating the arguments in favor of the Nicaragua route, and criticising the action of the Congress at Paris in accepting M. de Lesseps's scheme; Mr. Menocal closed the discussion in the same vein, and admonished M. de Lesseps that when he got to Panama he would find a very different working climate from that of Egypt, and a great difference between its sand and the rock he would have to perforate. The strongest argument we have seen brought into the controversy is the amount of rainfall at Panama, which is said to be a half greater than that along the Nicaragua route, and to threaten the construction and maintenance of the canal. The fact remains, however, that a railway has been built and is continuously worked on what is substantially the same line, undeterred by the rains. The other side of the question was by no means unrepresented in the discussion, and letters were read from Mr. Nathan Appleton, a member of the Congress, who defended its action and the Panama route; from Mr. Walter W. Evans, a builder of railways in South America, who believed firmly in a sea-level canal, but not in that of M. de Lesseps; from Mr. Frederick M. Kelly, who, as General Viele declared, had sent out seven different expeditions to survey routes for a canal, and had no faith in that of Mr. Menocal, but favored a sea-level canal. On the whole,

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it is likely that the Nicaragua scheme, though for the time being it has the ear of the public, is by no means sure, when the whole question of location comes to be generally discussed, of the suffrages of those who are qualified to judge.

WHATEVER may be the difficulty of fixing the cause of the fire in the Bellevue Hospital, which has seemed to baffle investigation, the causes which lent danger to it are clear enough; and if its lesson is not taken to heart it will not be for want of intelligibility. It ought not, indeed, to need the destruction of four lives to convince the community that hospital buildings which will burn like tinder before their occupants can be safely got out of them are not fit for their use, or that in any hospital, or any building, a room which connects directly with two dormitories is not a safe place in which to store combustibles. If there is any building whatever which should be built so as not to burn, it is one that is to be occupied by persons who, in case of danger, are absolutely incapable of moving out of its way. It happens, fortunately, that in hospitals sanitary considerations require the same kind of treatment that is necessary for security against fire, — that is to say, simplicity and openness of construction, hardness and impermeability of exposed surfaces, the absence of combustible material, which is also absorbent, and the avoidance of hollow spaces where contaminated air may linger or fire lurk unnoticed.

MUNKACSY'S PICTURE OF MILTON.

MUNKACSY'S Milton dictating Paradise Lost to his Daughters has now been some weeks on view at the Lenox Library. Within my recollection no single picture has excited such general interest in New York. Artists and laymen have alike flocked to see it, and this although it is peculiarly difficult of access. It is not in one of the convenient down-town galleries or shops, but where it necessitates a special pilgrimage and a special previous application for admission tickets — an application which has, unfortunately, to be repeated before each and every visit. The picture is so well known by reputation that to write in its praise would seem superfluous, were it not that it has recently been so severely handled by one influential paper that praise now becomes almost of necessity defence as well. The art critic of the New York *Tribune* has long been looked upon as the cleverest and most instructive of the American press. The general reader turns to him for trustworthy lessons, and our youngest, most promising school of artists for intelligent sympathy and comprehension. Often, also, they accept from him criticism and correction such as they would heed from no one else. When, therefore, the *Tribune* criticised Munkácsy's picture very harshly, its words, standing opposed to the universal verdict, professional and amateur, created general surprise. The gist of the criticism is that Munkácsy, whose first noted picture (The Last Day of a Condemned Man) led us to believe that he was "a dramatic painter with a special message of his own to communicate," has now, falling away from "the intensity of expression in this early picture, the truth of attitude and gesture, and the deep, instinctive power of feeling and sympathy," "entered the ranks of the painters of costume, furniture, and bric-à-brac, and left the story of humanity" to be interpreted by others. Of another picture of Munkácsy's (An Interior), recently exhibited at Goupil's, the critic complains that there "is no story told and no attempt at dramatic expression," and in the Milton, he resumes, "there is subject, but it is treated without sincerity, and without any real interest on the part of the artist. He cares nothing, knows nothing, except as he is told, and wrongly told, by some one else, of the incident he is narrating." In both pictures "we are reduced to admire the skilful painting of stuffs, costumes, and furniture, the arrangement of light and shade, and the clever drawing of the human figure." It is impossible to do justice to the vehemence of this condemnation without quoting the whole of this long paper. The writer does not even give unmitigated praise to the excellence of Munkácsy's achievements in the points last mentioned, but goes on to say that the painting of these things "does not give unqualified pleasure, for Munkácsy's color is most disagreeable, morbidly black and monotonous," although "the drawing is excellent and everything is in its place, and the technical merits of the picture challenge criticism. But there is nothing in the painting to enjoy for its beauty; we must be content to praise it for its skill." One can hardly believe, reading these last words, that some of us have been greatly indebted to the critic's own teaching for the realization of the fact that skill *is* beauty in a painting. Technical skill is not only a beauty that can absolutely and permanently be "enjoyed" by a trained eye, but a beauty without which no other beauty can exist for the trained eye. It does not comprise everything, of course. Skill alone is a delight, but skill representing an intrinsically beautiful object is a higher, and is the highest delight. I am not intent upon oversetting the opinion that there is no beauty in this picture apart from the workmanship. That must remain a matter of individual judgment. We may prove a critic right or wrong upon many points, but not upon the question whether a subject in itself seems to him unlovely, or lovely, as it does to us. Still I think there are few who could stand before the Milton, and agree with this critic. The tone is peculiar, — sooty rather than simply dark, but less pronouncedly so than in Munkácsy's earlier works. But there is much beauty of absolute and of contrasted color, and I know of nothing in modern painting more exquisite, for example, than the head of the daughter embroidering, whom the *Tribune* calls Mary.

I do not quarrel with the critic for finding or not finding this or that quality in Munkácsy's picture. What I do grieve over is that he looks for and insists upon the necessity of certain things that are *not* essential to this or any picture. One must regret that he sees fit to leave the true method of criticism, especially necessary, though, perhaps, especially difficult, with a public so untrained as ours, — the technical artistic method, properly so called, which accepts an artist's work as he offers it, and judges it by the rules of art alone. When our public needs to be taught the very difference between good and bad painting *per se*, and needs, in the presence of such a painting as Munkácsy's, to be told in what consists its immense artistic value as compared with the work of their popular favorites, it is disappointing to find a journal of the *Tribune's* well-earned authority confusing properly artistic with moral, philosophical, historical, and dramatic criticism. The most surprising of the various points the critic makes is his demand for "historical accuracy," as the main thing, "when a picture is given a name, and we are told that we are looking at real people." He elaborately rehearses the authentic story of Milton and his daughters, and complains that the scene was not painted in accordance, showing Anne's "personal deformity," which "is here corrected," and Milton's gouty hands, and the plain, shabby interior, and the general discomfort and atmosphere of family discord that history lets us into. Instead of which, according to him, we have "a tableau of the sort now so tiresomely common." Had Munkácsy painted his picture as this writer dictates it to him, it might have been forcible in a way, it might have been valuable as a document as accurately compiled as was possible in a distant age, relating to a past reality. It could never have been a picture of artistic beauty in the actual canvas, or of æsthetic value and truth in its effect upon our minds. Not all kinds of tragedy are fit for tragic art, — surely not tragedy of the sordid, prolonged, unimpassioned, domestic kind. Lear, mad with age and grief, is one thing; Milton marrying because his daughters were inattentive, and cutting them out of his will because they were undutiful, is another. And there is the same distance, judged as subjects for artistic treatment, between Lear's demoniac children and Milton's spiteful Mary, saying "it was no news to hear of her father's wedding, but if she could hear of his death it would be something." But whether historical accuracy was here advisable or not, is not the main point. The critic claims for it a *necessary* place in art. To argue the matter is to go back to the very A B C of criticism. It should surely be more than a truism by this time that such accuracy is *never* the highest, never even a very high factor in the artistic value of work. The fault the *Tribune* finds with Munkácsy is the fault the ignorant tourist finds with half the pictures of the greatest schools, — they are not transcripts of facts as they actually occurred. It is strange to see the *Tribune* doing likewise. Yet does not Mr. Ruskin, with that fatal Philistine instinct all his culture has not eradicated, find the same fault on occasion, aye, and with the cartoons of Raphael! Surely not only the greatest critics, but the greatest artists as well, have said often enough in actual words as well as in their works, that art is not history, and does not exist for the sake of history, nor for any sake but its own. It represents what suits its own aims, and, moreover, *as* it suits those aims, and alters history to adorn its own artistic tale. To cite but one example among a thousand, we know how Michael Angelo spoke of his portrait statues of the Medici. Munkácsy has not sinned, in altering the facts of Milton's biography, to suit his artistic purposes, and to emphasize his artistic ideal, unless Shakespeare has sinned in numberless plays, and Goethe in Egmont, and Schiller in Mary Stuart, and the Maid of Orleans, and every artist in words or color who has been an artist, and not a mere copyist of the prosaic surfaces of actual things. If Munkácsy had known no more of how Paradise Lost should have been written than every one knows, he had had no call to paint its writing, that writing having in reality been a subject most unfit for artistic treatment. But he has proved that he did know more, for he has shown us how in the ideal, artistic fitness of things it ought to have been written. He has shown us a beautiful dream that we shall never forget, and that will help us to realize the dreams of Milton himself. We shall not confuse it with reality, shall not even bring them into comparison. Who cares whether Richard III. were in reality a hunchback, when Shakespeare paints him so? And the great Germans in like manner define and clarify our conception of their heroes, and give us a new hold upon their lives and characters, though we do not believe, nevertheless, that Joan died on the battle-field, or that Elizabeth was taunted by Mary Stuart in her prison, or that Egmont loved and lingered with his Clärchen. For the critic of the *Tribune*, however, Munkácsy has not accomplished this which I believe he has accomplished for most of his public. The critic sees merely a "tableau," and believes that the artist has altered history for the mere sake of external prettinesses, and is aiming "merely to please a frivolous society by dallying with the surfaces of ignoble things." For him the human

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element in the picture is subordinate to the decorative. To me, and I believe to most others, Munkácsy seems to have altered facts for the sake of a high ideal, and to me he shows that ideal — the descent of the inspirational tongues of flame — by every line of the picture, and especially by the attitudes and expressions of the three women, so different from, yet so consonant with, each other. Upon the special technical merits of the painting, that the *Tribune* might so well have pointed out, it is not necessary to insist. I may say, however, that its main characteristic is its strength, its virile force of idea and execution. It is just this very quality that we need to have praised to us, as a wholesome antidote to our love of the emasculated suavity of our recent idols, — of Bouguereau, Meyer von Bremen, and the rest.

He who values individuality and force in art will be even more interested in the portrait bust of Munkácsy, by Barrias, also to be seen at the Library, than in his Milton picture. The latter is but a single witness to his power, and a witness that may, as we have just seen, be misinterpreted or disbelieved. But the portrait is a concentration, one is sure, of all that is strongest and most characteristic in the man. As a work of art it is delightful, executed with an incomparable *brio* and dash, yet with a painstaking accuracy that has seen to the careful modelling of every square centimetre of surface. Style and subject are wonderfully well suited to one another. The face is one that calls for bold yet careful handling, and the handling is such as would be wasted on a less characteristic physiognomy. There is a slight discrepancy between the two sides of the face that shows in every feature, — in nose and forehead and cheeks, in beard and moustache and eyebrows, and in the strabism of the eyes themselves. But this discrepancy, so accurately and lovingly followed by the sculptor, does not mar, it merely individualizes, the powerful beauty of the head. I can imagine no stronger presumptive refutation of the *Tribune's* presumptive grounds of complaint against Munkácsy's aims and ideas, than his face as here given. And I can recall, by the way, no brighter evidence that sculpture is not an altogether lost art to us moderns, than the bronze itself. It may be remembered that Barrias is the sculptor whose First Funeral, Adam and Eve with the Body of Abel, gained the Medal of Honor at the Salon of 1878.

An exhibition of American pictures has lately been opened in the Kurtz Building, and is, if I mistake not, to remain as a permanent place of sale for native works. There are not many important pictures there as yet. Those by La Farge and Shirlaw announced in the catalogue had not yet been hung at the time of my visits. The most noteworthy canvas was a large Still Life (23), by Mr. Chase. I do not remember a better piece of modern painting, in a similar field, than the brass dish in this picture. The solidity of the substance and the effect of its details are rendered with a marvellous rapidity and breadth of brush. The best landscapes were a delicate marine (107) by Mr. Quartley, and Mr. Macy's Marshes near New Bedford (93). This last is better than anything I have seen of Mr. Macy's. Though not faultless, — the sky is, perhaps, too heavy, — it has the great virtues so long lacking to our landscape painters, tone and atmosphere. Among the disappointments of the room may be reckoned Mr. Bridgman's pictures, which are much below his earlier work, I think. They are without tone or harmony of color, and have none of the perfect rendering of texture that is the characteristic of the master he follows. Nor has he caught the peculiar expression of Oriental faces that Gérôme gives so well, — the half-somnolent, half-suspicious glance, the slow, deep, fascinating, yet repulsive smile.

When I spoke last month of the new importations of the dealers, I had not seen those that Mr. Cottier now shows us. His taste and judgment are so well known to connoisseurs that it is unnecessary to say there is not a second-rate canvas among them. A special revelation is a number of Monticelli's, much the finest, I am sure, that have crossed the water. They are a very revelry of color. It were impossible to explain their wonderful charm if we believe in definiteness of some kind as imperative in a picture. It is impossible, however, for one who can be satisfied with the very perfection of a single element of beauty to forget them when once seen. They differ from pictures where line is given its legal place, as an intoxicating perfume differs from wine. Besides beautiful examples of Dupré, Daubigny, and Diaz, Mr. Cottier has landscapes by such admirable if less universally known artists as Du Chattel and Michel, and in his rooms we may again get a glimpse, though a very unsatisfactory one, of the incomparable Orpheus of Corot.

M. G. Van Rensselaer.

THE ILLUSTRATIONS.

THE METROPOLITAN CONCERT HALL, NEW YORK, N. Y. MR. G. B. POST, ARCHITECT, NEW YORK.

A CONCERT hall and garden is now building at the corner of Broadway and Forty-first Street, and extending through to Seventh Avenue. This property was leased by the Metropolitan Concert Company, Limited, — an organization incorporated under the laws of the State of New York. There will be a sliding roof, that can be opened or closed at pleasure, and a grand promenade around the roof. The orchestra, of fifty musicians, will be under the conductorship of Mr. Rudolph Aronson, the projector of the enterprise. It is to be a concert garden, where the people of New York, with their families, may enjoy recreation of a lighter order than Italian opera or symphony concerts, and at a reasonable price.

DESIGN FOR A COUNTRY HOUSE. MESSRS. ROSSITER & WRIGHT, ARCHITECTS, NEW YORK, N. Y.

ORGAN FOR THE OXFORD PRESBYTERIAN CHURCH, PHILADELPHIA, PA. MR. E. F. DURANG, ARCHITECT, PHILADELPHIA.

The organ here shown, which was built by Messrs. Hook & Hastings, was destroyed by the fire which a few weeks ago nullified the just completed labors of architect and artisan.

DESIGN FOR A CATHEDRAL. M. LALOUX, ARCHITECT.

We reproduce from the *Croquis* of the Intime Club the design which last year secured for M. Laloux the coveted position of grand-prize man at Rome and elsewhere for the following four years.

THE VIGO COUNTY COURT-HOUSE, INDIANA.

THE suit of J. A. Vrydagh against the commissioners of Vigo County, Indiana, exhibits a new phase of architectural life, and its history goes to show how even the best of architects may, through the eagerness to obtain employment, which is inherent in all men, get not only themselves but others into difficulty. It would apparently be a good move on the part of our State Legislatures to create a board of experts, or other body, charged with the care of all public buildings in process of erection, and to have especial charge of competitions and the letting of contracts; by this means perhaps competitions and contracts might be awarded in a more satisfactory manner.

It appears, from the records of Vigo County (and this is the first record in regard to this matter), that the commissioners, on December 2, 1872, resolved to build a new court-house in the city of Terre Haute, according to plans and specifications then submitted to the Board by J. A. Vrydagh, architect, and at the same time Mr. J. B. Snapp made his proposition in writing to erect said court-house, according to said plans and specifications, and by the outlines of the elaborate elevations and the stone trimmings of plain elevations, for $292,000; and the Board, being advised (it does not appear who gave the advice, but the supposition is that it was given by Mr. Vrydagh), accepted said proposition. The bond of Mr. Snapp was tendered, approved, and entered of record, and Mr. Vrydagh was employed with full architectural powers at the usual rate of five per cent for his services.

In the interim between December 2 and 10 the Board discovered that the contract they awarded on the 2d was only for the enclosing of the building and not for a complete structure finished in all its parts; they also discovered that there was a manifest disapproval on the part of the citizens, amounting to an almost unanimous voice against building a court-house at that time, and especially under such circumstances. The Board therefore ordered that the contract of December 2, 1872, with Mr. Vrydagh and with Mr. Snapp be rescinded. Notwithstanding this, the commissioners, only seven days thereafter (to wit, December 17, 1872), again found the present court-house unsuited for its office, and unsafe on account of fire, and they again ordered that a court-house be erected within a specified time, and for the specified sum of $250,000, the records showing among other requirements one that the building should have fire-proof rooms attached. This time they advertised for bids and stated that the same would be received until the first Monday of March, 1873, and that each bidder should present his own plan and specification, together with his bid. But no plan or specification should be paid for except the ones adopted, this last clause being intended, no doubt, to exclude all bidders and architects except Messrs. Snapp and Vrydagh. On March 4, 1873, the day upon which plans were to be submitted and bids tendered, as required by the action of December 17, 1872, Mr. Vrydagh presented plans for a new court-house (the same plans that he presented at the previous meeting), which was examined and adopted by the Board, and he was ordered to prepare duplicates on vellum, detail drawings, and specifications, and file the same with the auditor on the 14th day of the same month, which was allowing a rather short time to do so large an amount of work, and the natural inference must be that they were already prepared.

March 18, 1873, for the third time the Board found the present building unsuited and unsafe for county offices, and they again ordered a new court-house to be built; and that the plans and specifications prepared by Mr. Vrydagh, and on file with the auditor, should be adopted, and the building built according to the same, and that bids be received for the erection of said court-house until June 4, 1873.

June 3, 1873, the Board met in regular session, and all the previous orders in reference to the erection of the court-house were set aside, and on June 10, Mr. Vrydagh having asked the Board if he should complete the working drawings, the Board replied that they desired no further work done; here ends the reading of the county records so far as this case is concerned.

Mr. Vrydagh, in his contract with the Board, based his charges upon the schedule of the American Institute of Architects; he therefore sues for three and one half per cent, instead of the customary two and one half per cent.

His claim for fees is as follows: one per cent on the cost of the proposed building for the preliminary sketch, the proposed cost being $406,000, or $4,060; and three and one half per cent on the second court-house, the proposed cost being $250,000, or $8,750; and interest and damages sufficient to make a total of $15,000.

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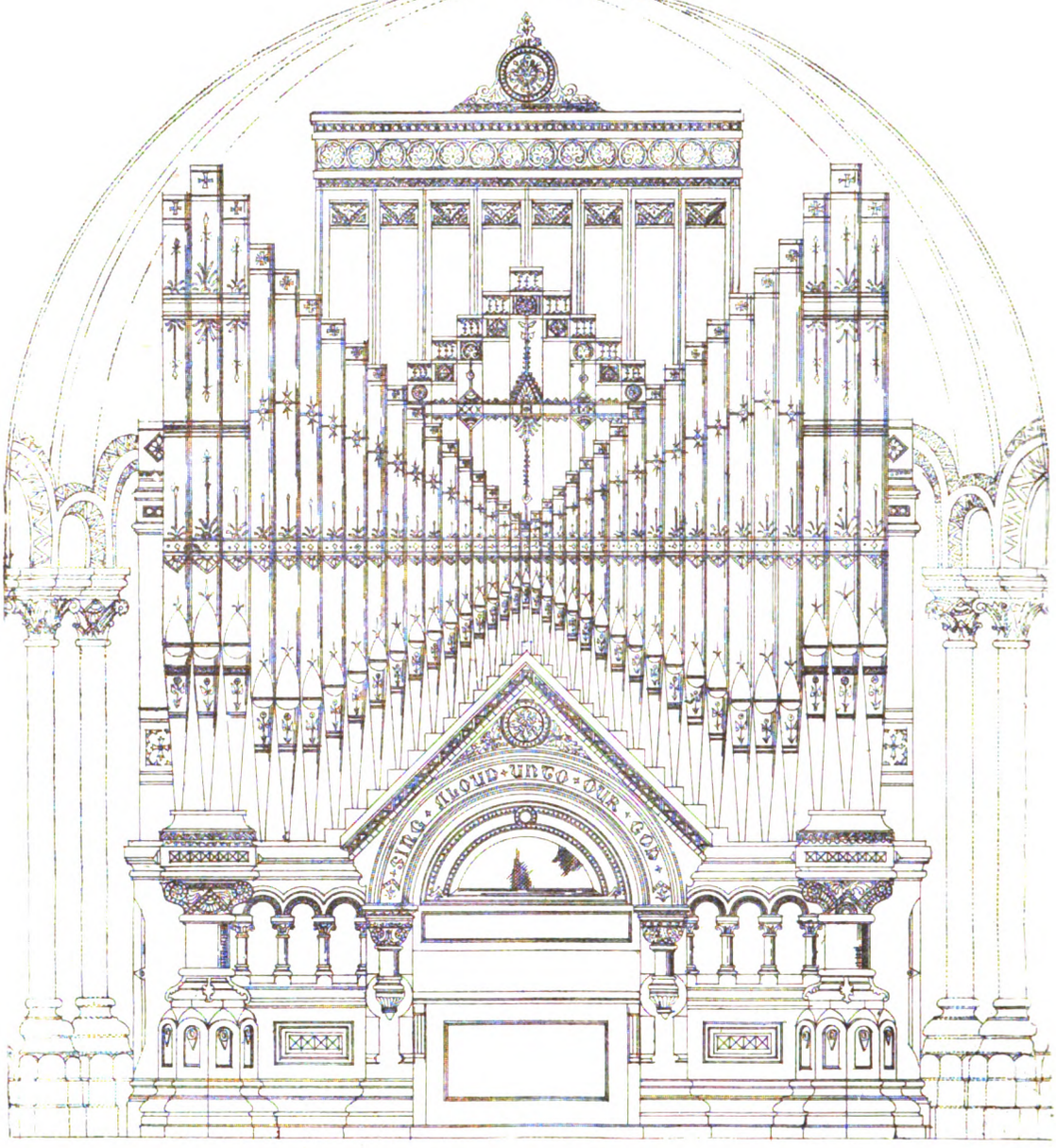
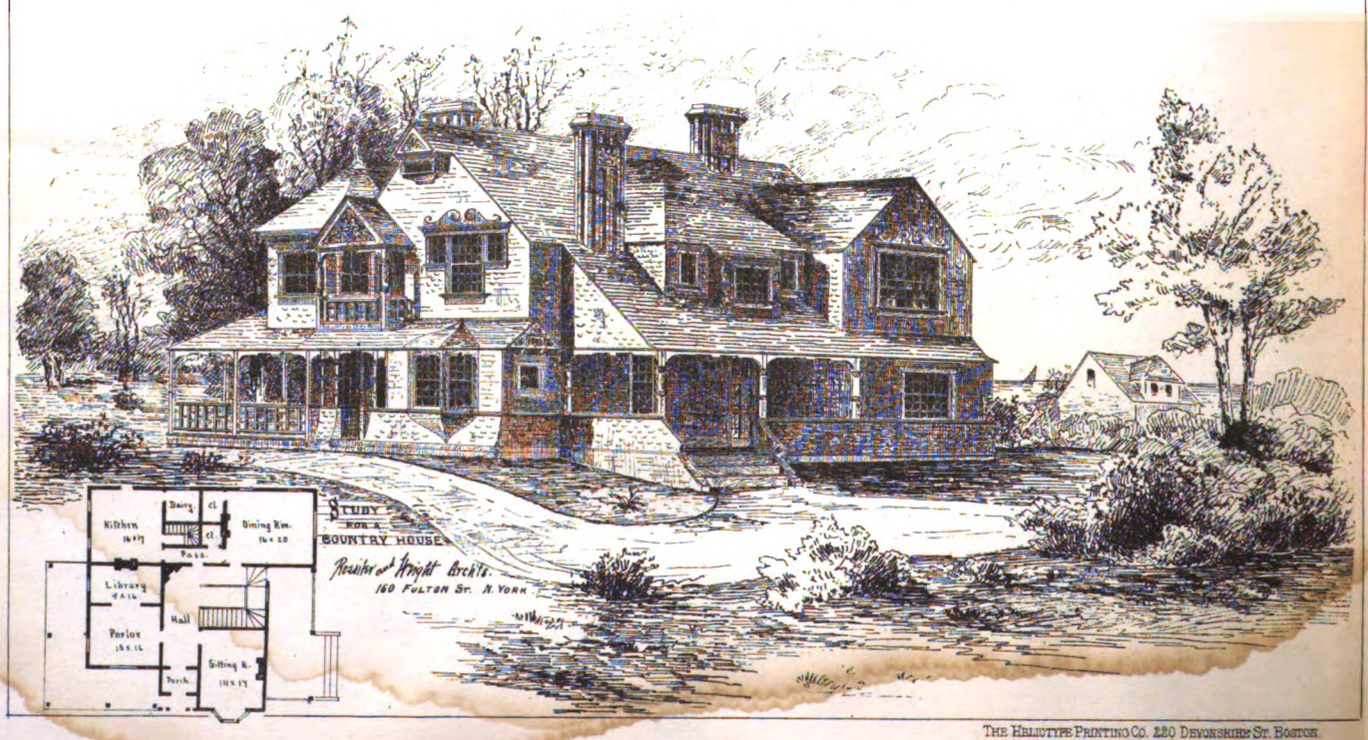


FRONT ELEVATION

C. F. Durang. ARCH. PHILA.



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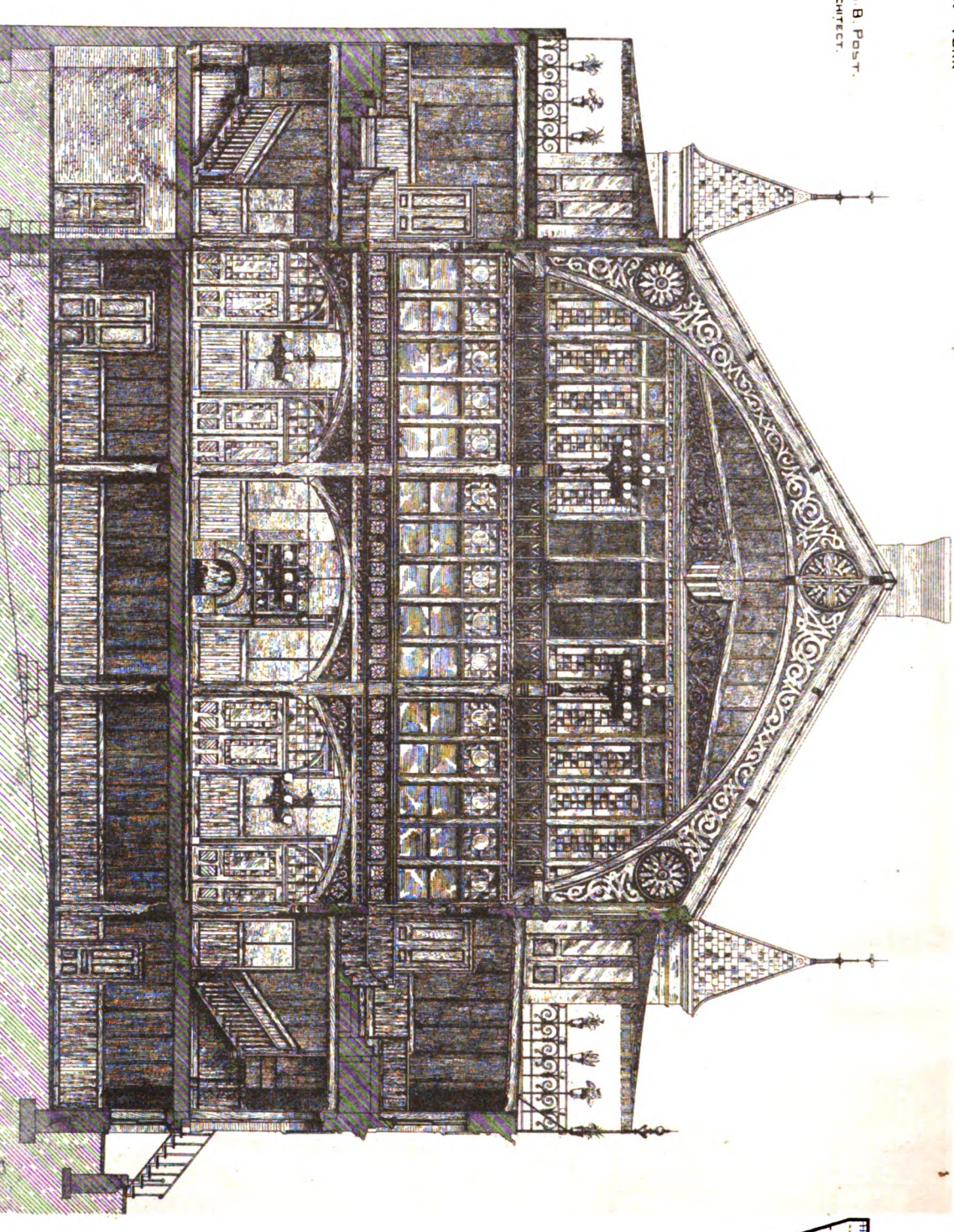

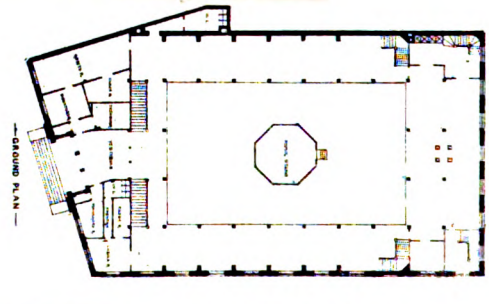

—GROUND PLAN—

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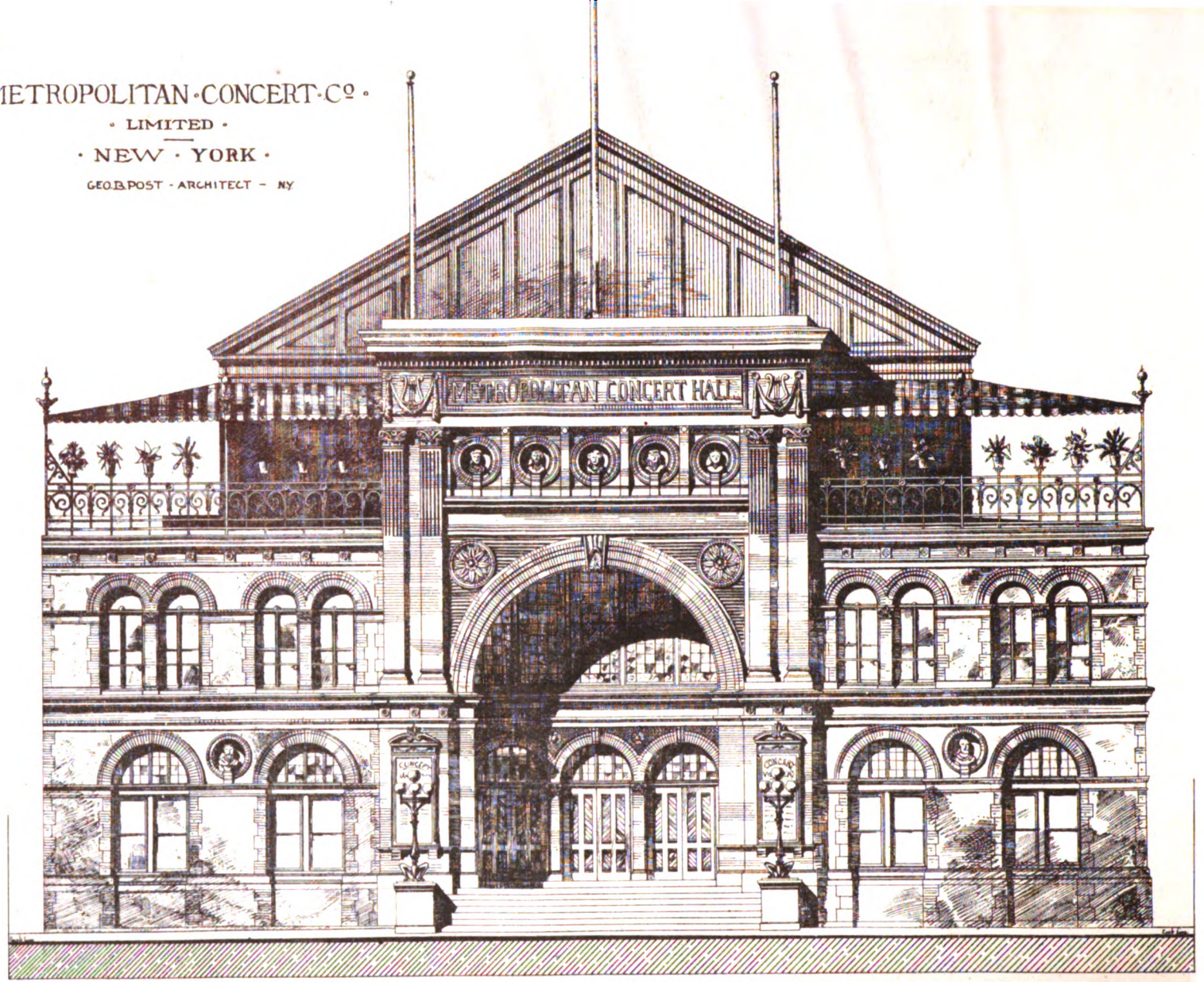

FRONT ELEVATION

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ELEVATION PRINCIPALE

COUPE LONGITUDINALE

PLAN DE LA CRYPTE

UNE CATHÉDRALE

CONCOURS DU GRAND PRIX DE 1878

A D R A

1er GRAND PRIX

Mr LALOUX, Elève de Mr ANDRÉ

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How Mr. Vrydagh can claim his full percentage is somewhat obscure, from the fact that on June 3, 1873, as we have before stated, he asked the Board if he should complete his drawings, and received a negative answer. The whole case looks as though there had been collusion somewhere.

An entirely new board is now in office, and as it was their desire to do right by all parties, being ignorant of what architectural services are usually worth, they summoned to their aid, in December, 1878, a board of experts, composed of I. Hodgson and W. H. Brown, of Indianapolis, Charles Eppinghausen, of Terre Haute, and Charles Crapsey, of Cincinnati, all architects, to inform them upon this and other points. The chief duty of the experts was to prepare a full and careful estimate of the cost of the building, which they found to be $182,000 complete. The plans call for fire-proof construction in the first story and cellar, and this end is gained by means of brick groined arches, which spring from the walls at the outer sides, and from iron columns in the centre of each room. Above the first story the construction is of wood entirely; some 275,000 feet board measure being used, which amount of wood is sufficient, we should judge, to nullify the expense and pains taken to fire-proof the first story, inasmuch as a fire in the roof would let great weights fall upon the groined arches and iron columns, and probably destroy them.

The attorneys for the county put certain questions, which, with their answers, were as follows: —

Question. What is meant by "preliminary sketches," and are such sketches charged for? *Answer.* By the term "preliminary sketches" are meant such sketches of a proposed building as an architect usually prepares in advance, for the purpose of arriving at a final and definite understanding with his client, and when the architect is finally employed to prepare full drawings and specifications they are considered as forming a part of such service, and are not separately charged.

Question. What is meant by and involved in the term "fire-proof"? Does the fact that a particular portion of a building, if isolated, is or would be fire-proof, but if constructed with other portions would not altogether be fire-proof, entitle the architect to any additional credit by reason of such portions being fire-proof? or does it add to the merit of the building? *Answer.* By the term "fire-proof" is meant a building constructed entirely of incombustible materials. A building cannot be considered fire-proof when inflammable materials enter largely into its construction.

Question. When an architect submits plans and specifications, what is the rule as to his duty in relation to fully advising his client as to the cost of the building? Has he any right to guess at it? *Answer.* It is the duty of an architect to advise his client as to the cost of a proposed building, which he should be able to do with a reasonable degree of accuracy, say, within a margin of ten per cent.

Other questions were asked, but they were not of sufficient interest to require to be noticed here.

The case was tried during the week ending December 6 inst. before a jury, during which trial all the points before stated were fully brought out by the attorneys on either side. The jury returned a verdict for the plaintiff of $10,425. Just how they could reason out such an amount is something beyond the understanding of any one, unless it be the jury. The case, we understand from the attorneys, is to go to the Supreme Court of Indiana. **

THE SEWERING AND DRAINING OF CITIES.

A PAPER read before the American Public Health Association, at Nashville, by George E. Waring, Jr., of Newport, R. I., sets forth a radical change in sewerage practice. We published last week (page 189) so much of this paper as describes the details of the work, — which has especial interest at this time, since the plan has been finally adopted for the city of Memphis. We now give the rest of the paper, as a necessary elucidation of that description: —

"The president has asked me to prepare a paper concerning the most perfect methods of city sewerage, one which may serve as a standard of comparison in considering the character of existing work. It would savor of presumption to describe or to prescribe methods radically different and better than those now in use. It is impossible to foretell the improvements which are to grow out of the present rapidly-increasing interest among intelligent and ingenious men in all that relates to sanitary practice. If I were to attempt now to set forth the details of a perfect system of sewerage, I fear that my recommendations, like Dr. Richardson's City Hygeia, would surpass what practical men and investors of capital would accept.

"The most that it is prudent to do is to consider the question in its purely sanitary bearings, and to indicate in what way the best requirements of public health may be met, in the light of our present knowledge.

"So far as we can judge of the future from the indications of the present, it would seem that in one respect we are to witness a very marked change in the practice of sanitary engineering. There is much reason for believing that there will be a distinct separation between the application of sewerage to the removal of domestic and manufacturing wastes and soil-water, and the construction of conduits for the protection of public and private property against the action of storm-water. This latter, like the construction of roadways and bridges, will be treated as a purely civil-engineering question, having at best only an indirect sanitary relation. The interests of public health, so far as sewerage is concerned, will, in my opinion, be best served by a close adherence to the collection and removal of foul waters, and to their proper final disposal.

"This suggestion is not new. The discussion between the advocates of the combined and the separate systems of sewerage, especially in England, has long been active. The issue between them seemed doubtful until the matter of agricultural or chemical purification of the effluent became prominent.

"The arguments in favor of the exclusion of storm-water from the sewers proper seem to me so conclusive that I no longer hesitate to accept such separation as essential to the best sanitary sewerage.

"Sewers large enough to remove storm-water, according to the usual formulas, are open to several serious objections.

"The question of cost is so often the controlling question, even in improvements of the most vital importance, that the expense entailed by the construction of storm-water sewers constitutes an insuperable obstacle in the case of many a small town where sewerage is most necessary. Even in the larger cities the expenditure in this direction might sometimes, if not always, be economized for the benefit of other necessary work.

"The larger the sewer the more difficult becomes the matter of ventilation.

"Cases are extremely rare where sewers of the storm-water size are not, at least during the dry and hot season, sewers of deposit to such an extent as to have their air made most foul by the decomposition of their sediment.

"Where the question of final disposal has become important, the admixture of storm-water with the sewage leads to the constant embarrassment of the system, whether the process be chemical or agricultural.

"There seems to be no controlling reason why storm-water should be admitted to the sewers at all for very long reaches of the streets; and not seldom, throughout the whole of the smaller towns, the whole rainfall may be discharged over the surface without causing inconvenience.

"Until about 1854 the cities of Albany and Troy, both large towns, and both having very steep grades, terminating on level ground, had no storm-water sewers. The inconvenience caused during heavy storms was inconsiderable, and there was practically no material injury to public or private property. I am informed by the engineers of both cities that neither inconvenience from the overflowing of the streets nor injury from wash constituted an essential argument in favor of sewerage. The sewers were built to the storm-water rise only in conformity with the general custom.

"The carrying of surface-water to a depth of ten or fifteen feet below the surface seems to be at least unnecessary. Street-wash can be safely admitted to sewers only after passing through settling-basins, which are sure to accumulate an offensive and dangerous amount of decomposing filth.

"I believe that one of the most important improvements that we are destined to see is the removal of storm-water, as far as possible, by surface gutters, — carrying away the greater accumulations through very shallow conduits, largely, perhaps, through covered gutters, easily accessible for cleaning and flushing.

"This part of the engineering problem being satisfactorily provided for, the sanitary drainage of a town — the removal of the wastes of its population — becomes a simple problem. It implies, however, one condition which, although almost unknown in America, has been shown by foreign practice to be an attainable one, — that is, it requires that the streets be kept clean by some other means than occasional drenching by storms. There is no more inefficient, costly, and dangerous scavenger than the rain which falls upon the surface of our roadways, and washes their horse-droppings into the catch-basins at the street corners.

"Circumstances are occasionally such, as in St. Louis, as to require extensive engineering works for the removal of storm-water through very deep channels. Ordinarily, as I have before said, the removal of storm-water is a very simple matter, if we will accept the fact that it is best removed, so far as possible, by surface gutters, or, in certain cases, by special conduits placed near the surface.

"It is often necessary, in addition to the removal of house waste, to provide for the drainage of the subsoil. This should not be effected by open joints in the sewers; because the same opening that admits soil-water may, in dry seasons, and in porous soils, permit the escape of sewage matters into the ground, which is always objectionable. Soil-water drains may be laid in the same trench with the sewers, but preferably on a shelf at a higher level; and they should always deliver into the upper part of the sewer or into a man-hole at a point above the flow-line of the sewage, or at an independent outlet.

"There is one point connected with the drainage of towns which is not sufficiently appreciated, especially in this country, — that is, that it is easy and cheap to secure a deep outlet in low land, and to deliver sewage at a considerable elevation for agricultural treatment, by artificial pumping.

"The average cost of pumping for water-works is about nine cents per foot of elevation for each million gallons raised.

"On this basis the cost of raising the sewage of a town of 10,000 inhabitants, supposing every three persons of the population to contribute one hundred gallons per day to the flow, would be about three cents per day for each foot of elevation.

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"Even supposing that twenty inches, or about one half of the annual rainfall, finds its way into the subsoil, the cost of lifting this ten feet to a surface outlet would, on the same basis, cost only about $160 per annum for each one hundred acres of the town area.

"Both of these estimates are practically somewhat too low, because a small amount of water cannot be lifted relatively so cheaply as a large amount. I give these figures only to show that, with a community of any considerable size, it is really a matter of minor consequence whether the natural outfall is high or low.

"The experience of Holland, in the practice of drainage, indicates a complete relief for the natural disadvantages even of the city of New Orleans, of which the cost would be quite insignificant as compared with its benefits.

"Many of our riparian towns, dependent upon high-lying water as the outlet for their drainage, or, like Chicago and Milwaukee, delivering their foul drainage into streams whose contamination means the contamination of the town itself, may find their only practical relief by means of an artificial outlet. The city of Boston is now establishing a conspicuous example of the application of mechanical power to deep drainage and distant removal, — even applying this costly means for the discharge of the rainfall of an enormous area.

"Aside from its benefit in securing deep drainage, discharge by pumping makes us quite independent of natural topography in adopting means for agricultural disposal. Pumping, and the separate removal of foul wastes, puts it in our power, under all circumstances, to adopt this means for purifying our outflow. Along our greatest rivers, from the sanitary standpoint, the disposal question counts for nothing. The Mississippi River will annihilate the sewage of St. Louis, to whatever size she may grow; but there is an enormous proportion of our towns which must, for purely sanitary reasons, adopt some other means of outlet than delivery into rivers and harbors.

"There is an agricultural consideration, and an important one, which looks to the utilization of all our sewage; but in the present condition of our agriculture, this must remain a secondary argument. Wherever we resort to irrigation as a means of purification, the manurial value of the sewage will serve to lessen the cost of our work. Probably it will nowhere repay the whole cost.

"The methods of irrigation disposal are various, and all are not equally well adapted to all conditions. The outflow of a large town can be purified satisfactorily, either by simple irrigation over large areas or by intermittent downward filtration over much smaller areas of land properly graded and deeply underdrained. Under this system the discharge is intermittent, and during the intervals the soil-filter is purified by atmospheric action.

"The outflow of smaller towns, of public institutions, and of suburban and country houses may be much the most satisfactorily treated by the absorption-drain or sub-surface irrigation system, working in conjunction with Field's flush-tank. By this system a small area of land, naturally or artificially well drained, is underlaid, at a depth of ten inches from the surface, by a series of open-jointed, agricultural drain tiles. At each discharge of the flush-tank, the accumulated sewage is sent rapidly into the tiles, whence it escapes through the open joints into the soil. During the interval between the discharges, the water, purified by filtration, settles away to the subsoil, and fresh air enters, to supplement, by oxidation, the purifying action of the roots of the grass or other crop growing on the land.

"This latter system has now been so thoroughly tested under various conditions, as to climate and quality of soil, as to have proved itself of almost universal applicability. It has the very great advantage that, as the sewage never appears at the surface of the ground, it may be carried on in immediate proximity to the dwelling. It would be equally effective, under proper arrangement, in dealing with the sewage of cities; but for such use it would be much more costly than would the removal of the sewage to a distant field, where surface irrigation would be unobjectionable.

"I trust that, as I am neither a Southerner nor a physician, I may be excused for attaching more importance than many of you probably do to the proper drainage and cleansing of a city, and to the proper disposal of its outflow, and more than to any system of quarantine. My knowledge of the history of the yellow fever epidemics in this valley is infinitely less than yours; but I feel warranted, and I take my warrant from the history of the plagues which devastated the filthy mediæval cities of Europe, and from my own knowledge of the want of cleanliness and want of drainage in the city of Memphis, in venturing the suggestion that even that fever-smitten town may be made an impossible field for the invasion of yellow fever in an epidemic form.

"While yellow fever is for the moment uppermost in all our minds, and while its sudden and more fatal outbreaks strike the public imagination with peculiar force, we should, as sanitarians, never lose sight of the fact that it is one of our minor diseases; that, indeed, along the banks of the Mississippi River, far greater mortality, and infinitely greater disability, result from the constant operation of diseases which should come equally within our purview, and which are equally preventable by measures of sanitary improvement."

The London *Times* states that bas-reliefs and statues, some of them of colossal size, have been found at Marathon, near the site of the Temple of Nemesis.

THE YELLOW CEDAR OF ALASKA.

Mr. John Muir, in the course of a description of the trees of Alaska, in an article in the San Francisco *Bulletin*, speaks as follows of the yellow cedar: —

The most important of these as to timber is the yellow cedar, or cypress (*Cupressus Nutkatensis*), a truly noble tree, attaining a height of 150 feet, and diameter of from three to five feet. The branches are pinnate, drooping, feathery, dividing into beautiful light green sprays, like those of the California libocedrus, but with finer foliage and more delicate plumes. The wood of this tree is undoubtedly the best the country affords, and one of the most valuable to be found on the whole Pacific coast. It is pale yellow, close-grained, tough, durable, and takes a good polish; and to these qualities is added a pleasant fragrance, like that of sandal-wood.

The only California wood that resembles this is the torrega, which has the same delicate yellow color and close texture, but the pleasant scent is wanting, while the trees are small and scattered in and out of the canyons. Some three or four ships have been built of yellow cedar, and small quantities, a few thousand feet at a time, have been sent to Portland and San Francisco from Sitka, Fort Wrangel, Checan, and Port Simpson, probably less than a million feet in all. Some little goes to China, and is made into fancy boxes, it is said, to be returned to us for camphor-wood. It deserves to be far better known, not only to shipbuilders, but to carpenters and furniture makers. The Indians here make their paddles of it, and weave matting and coarse cloth from the inner bark of the tree, which is quite durable, and of a fine brown color. It is also the favorite fire-wood of the coast region, burning very freely, though it does not last long. A yellow cedar fire, to any one witnessing it for the first time, is quite a notable phenomenon. The flames quiver and rush up in a multitude of ragged-edged lances, while the burning surfaces snap and crackle and explode, and throw out a shower of glowing coals with such a noise that conversation in an ordinary pitch of voice is at times impossible. Every open hearth in which this wood is burned has to be closely screened with a framework of wire netting, else the floor would be sown with cinders. The durability of this timber is forcibly illustrated by the fallen trunks lying in the damp woods. Many of the largest of them last for centuries, retaining even the delicate color and fragrance unimpaired. Soon after they fall they are overgrown with moss, in which seeds lodge and germinate and grow up into vigorous saplings, standing all in a row on the backs of their ancestors. As they grow larger they stand astride, sending their roots down and out on both sides like the straddling legs of a spider. And, after they have reached an age of several hundred years, the down-trodden trunk when cut into will almost always be found as fresh in the heart as it was when it fell. Decay goes slowly on from the outside, never commencing in the heartwood, as far as I have noticed, though a good many of the living trees are injured by a fungus which produces a dry-rot similar to that found in thuja and libocedrus. The species is found as far south as Vancouver Island, and is pretty generally distributed along the coast and through the islands, as far north as Sitka, — how much farther in either direction I am unable to say. But though its range is thus extensive it does not seem to be very abundant at any one place, or to occupy any considerable area to the exclusion of other species.

A NEW FEATURE IN CINCINNATI FAIENCE.

The interesting paragraphs on Cincinnati Faïence in a late number of the Contributors' Club suggest the mention of other work in this way which is being done among us. Mrs. N. B. Plimpton, of this city, is working out an original style of decoration in faïence, whose effects are different from anything hitherto known.

The Sèvres porcelain gives us the most exquisite effects in color; the Haviland a bewildering depth of richness and changeful iridescence; the old Meissen has its individual beauty, differing from all in its deep-modelled decorations in *alto-relievo;* but differing from these or from any important type of decoration is the method now being wrought out by Mrs. Plimpton. It is a decorative relief in different clays, so delicately blended and shaded that only the trained eye of the connoisseur would see that these exquisite blendings of color were not painted, but were worked in in the different clays which, through the process of firing, retain their relative colors, — these colors being, of course, changed in the firing, but coming out with relative variations.

The finest example of this is shown in a vase of light-yellow clay ornamented with a butterfly in relief, of that large and curious variety known as the South American. The butterfly is shown in four shades of browns, — the rich sepia browns, — and white, and no one on first observing it would dream that not a brush had touched it with paint, but that each different shade of color is a different clay, or combination of clays. The insect is shown in as precise a portraiture of all the little anatomical details as a painting could give. The little antennæ, the "suckers" about the mouth and head, the all but invisible peculiarities of butterfly structure, are faithfully reproduced. The butterfly is represented as soaring from some reeds and starry-flowered grasses. The little star-eyed flowers are in white, and the petals as distinct as in nature. This decoration is all modelled in the wet clays. After firing, the coat of glazing is added, — for it should be clearly understood that this is all underglaze work, — and the last firing is given. — *Atlantic Monthly.*

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"CENTRAL MUSIC-HALL," CHICAGO.

KEOKUK, IOWA, December 8, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — Referring to Mr. Hallberg's letter in your issue of November 29, the only present possible danger which is apparent on a hasty inspection of his sketch is the shearing or detrusion of the iron plate or lintel over the main door-opening where it rests on the iron columns in the south jamb.[1] There may also be detrusion or crushing weight that these columns impose on the south jamb of the six-foot openings underneath them. The overstep of the wall of one foot five inches, between the vertical line of the south jamb of the main door-opening and that of the north jamb of first gallery door-opening, is dangerous *only* if the iron plate above alluded to be insufficient for the duties it serves. If the footings of the walls have been properly distributed underneath the vertical lines of pressure of the jambs of openings, and proportioned according to the superincumbent weights, and are omitted from under openings where no weight of piers or jamb is imposed — so as to avoid the tilting leverage of *continuous* footings under openings, and thereby unequal settlements, whereby the wall would be liable to weakening by rending, etc. — and so that the wall will remain homogeneous, there is no immediate danger to be apprehended, provided no serious tendencies have yet appeared, and that the work has all obtained its permanent set, as it will require an extraneous force or strain nearly equal to its stability to do violence to its integrality.[2] I may remark, in reference to the quoted strengths of brick, that they are derived from that of a class of brick and of brickwork superior to what is usually produced in this country under the contract system and close, unscrupulous trade competitions. The corbelling strength of the portion of wall between the top of the main floor-opening and the foot of the roof-truss is sufficient to carry the truss, when the brickwork is good and is properly set, and everything adjusted to its ultimate bearing. There appears to be about thirty-five feet vertical of twenty-five and three fourths inches wall projecting about four feet over the north jamb to a vertical line under the centre of the roof-truss bearing. This overhanging weight is balanced by the greater leverage of the northerly truss, and is compensated and resisted by the cohesive strength of this and adjacent parts of the wall sufficiently to counteract any ordinary disturbing force of the mass of brickwork, etc., of about twenty tons per foot lineal.[3]

The above, although somewhat apologetic, is not intended in any sense as a defence of such reckless constructive design, but rather to appease any unnecessary apprehensions. Strictly speaking, the data given by Mr. Hallberg are scarcely sufficient to authorize any who have not personally examined the building-quality of materials, manner of workmanship, etc., in giving an emphatic expression of opinion as to the extent of the possible danger, if any.

The linear expansion of the iron roof-trusses will probably not exceed one half inch or five eighths inch. The walls would each spring half of this distance without any serious injury if of good materials and workmanship.

This subject is deserving of exhaustive discussion, and to this end *all precise* data should be supplied which affect the critical solution of the problems involved. ALEX. BLACK.

THE HYPÆTHRAL QUESTION.

BOSTON, December 11, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — In a communication in your issue of December 6 Professor Norton says: "It appears plain that Mr. Davidson has permitted himself to make positive and incorrect statements concerning the opinions of Dr. Reber."

Now, as I made only *one* statement, and that on another's authority, with reference to one of Dr. Reber's opinions, I can hardly have made more than one incorrect one. I think, therefore, I might return with interest Professor Norton's remark, and adhering strictly to fact in the matter of number, say that he has made a "positive and incorrect" statement on his own authority, concerning me. But, after all, how far was my statement "positive and incorrect"? When a writer makes an assertion and immediately cites a well-known and generally trustworthy authority for it, he makes himself responsible clearly for the correctness of the citation, but not for that of what it contains. The worst that can be said of him is that he has been incautious in the use of an authority, — an incautiousness which must be held to diminish in proportion to the usual reliability of the authority and the accessibility of the means for controlling him. Now when I made my assertion about Professor Reber I not only cited my authority, but gave clear reference to the passage I had in my mind. It reads as follows: "Ἰδε λ. χ. πῶς ἐν νεωτάτῃ βίβλῳ πανεπιστημακοῦ καθηγητοῦ τῇ τοῦ Fr. Reber, *Kunstgeschichte des Alterthums*, Leipz., 1871, ἐν σελ. 206 κ. ἑξ. λέγονται τὰ περὶ τῆς καμπυλότητος τῶν φαινομένων ὁριζοντίων καὶ ἄλλων εὐθειῶν γραμμῶν, μετὰ πόσου ὀηλ. Πυῤῥωνισμοῦ ἐκτίθενται καὶ πόσον εἰρωνικῶς ἐγκρίνονται πράγματα ἀπὸ τεσσάρων ἤδη δεκαετηρίδων γνωσθέντα," which means: "See, for example, how in the most recent work of a university professor (Fr. Reber's *K. des Alt.*, Leipz., 1871, pp. 206 seq.) the question concerning the curvature of the horizontal and other apparently straight lines in Greek architecture is treated, that is, with what absolute skepticism (Pyrrhonism) are set forth, and with what mockery[4] are criticised, facts that have been known for forty years." Unless, then, this translation can be shown to be incorrect, my authority says what I attributed to him, and my only fault was that I did not refer to Dr. Reber's work itself. This I should most certainly have done, had it been within my reach; but as I did not own the book, and there is not a copy of it in either the Boston Public Library or the Athenæum (a fact which furnishes a presumption that it is not a work of much authority), I was obliged to accept Professor Koumanoudhis's statement, which I gave on his authority. In spite of this Professor Norton charges me not only with incautiousness, which is hardly fair, but with making "incorrect statements," which is entirely groundless. I have certainly no desire to undermine Dr. Reber's authority, although I do not regard it as high; but I do strongly object to having a mere complimentary remark of his in a private letter used to weaken what I have established by facts and citations.

I am, however, after all, very much obliged to Professor Norton for his two communications. In the first he shows his desire to defend Mr. Clarke's theory, and in the second his willingness, even at the risk of inaccurate statement, to contest assertions of mine; whence I think I may fairly conclude that even he, with all his well-known scholarship, knows of no proofs sufficient to render even plausible Mr. Clarke's theory of the artificial lighting of Greek temples. I am, sir, Very truly yours, THOMAS DAVIDSON.

A SCULPTOR AND HIS MODELS.

BOSTON, December 12, 1879.

TO THE EDITOR OF THE AMERICAN ARCHITECT:

Dear Sir, — I wish to ask your opinion on the professional rights of a case that has happened to me.

I am engaged to make a marble bust (portrait), — make it, deliver, and receive my money, just as I have always done, — that is, no special agreement or stipulation. As it often happens, I leave the original plaster copy at the shop of the marble-cutter. The family for whom I made the marble copy go to this cutter, and, without my knowledge or consent, employ him to cut another marble copy from my original plaster copy. He does it. I find this out, and protest, — saying, first (to the family), You have no right to use my property, and, second, You may injure me by reproducing my work without my care and supervision.

They reply that the plaster copy is theirs (though there was never any stipulation to that effect, nor was anything like it understood). I claim remuneration for the use of my plaster bust, and the right to pronounce as to the merit of its second reproduction in marble. They say, No, we have not signed your name to the last copy, nor have you a right to sign it. It is all ours, to do with as we please, plaster and marble.

What do you think about it?

I shall be greatly obliged to you for an opinion. I mean to contest, if there is any ground.

Very truly yours, T. H. BARTLETT.

PUBLICATIONS RECEIVED.

BUILDING SAFE-GUIDE. By Charles Marcotte, St. Louis, Mo. 1879. Price $1.00.

THE WORKSHOP COMPANION. A Collection of Useful and Reliable Recipes, Rules, Processes, Methods, Wrinkles, and Practical Hints for the Household and the Shop. New York: The Industrial Publication Company. 1879. Price 35 cents.

ILLUSTRATIONS OF THE HISTORY OF ART. Part III. Architecture and Sculpture of the Renaissance Period and of Modern Times. Boston: L. Prang & Co. 1879. Price $2.00.

NOTES AND CLIPPINGS.

THE occurrence of Christmas Day next week, and the desirability of mailing with our next issue the index of the current volume, will together somewhat delay the delivery of the next number of the *American Architect*.

THE SANITARY SURVEY OF MEMPHIS. — The committee which made a sanitary survey of Memphis recommend a sanitary superintendent for that city; that all houses be chilled and ventilated; that a new system of water works be adopted, to be under the control of the city; that the use of cisterns and wells be discontinued; that several houses be torn down and their material burned; that a system of sewerage be adopted by which all drainage will be discharged into the Mississippi; that the bayous be properly drained, and a stream of pure water continually run through them, and their banks grassed; that they be protected from back water by dams; that all buildings be erected subject to sanitary plans, and that all streets be constructed of gravel.

THE LUXEMBOURG PALACE IN DANGER. — The *Standard's* Paris dispatch says that the Luxembourg Palace has narrowly escaped destruction. A fire, which had been smouldering for some time, broke out under the flooring of the library, but was discovered before it had extended. A number of books were burned.

[1] No dimensions, etc., of this plate are given whereby to judge of its sufficiency.

[2] The resistance to crushing of *brickwork* is considerably less than that of single *bricks*, with which it is often confounded.

[3] The allowance for live loads and strains should be deducted to obtain the net dead load.

[4] Εἰρωνικῶς is rendered in Th. Kind's Modern Greek Dictionary by *spöttisch*, which may be fairly rendered by "with sarcasm and contempt."

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John Wesley's Chapel. — By the fire on Sunday, December 7, which threatened the total destruction of the Wesleyan Chapel in City Road, London, the main chapel was greatly injured and the historic building, Wesley's morning chapel, was gutted. Wesley's pulpit was saved. The beautiful frescoed ceiling is irreparably injured, and great doubts are entertained whether the roof of the structure can be restored.

The Towers of Cologne Cathedral. — At present the towers of Cologne Cathedral are, after the new *flèche* of the cathedral at Rouen, which is 492 feet high, the highest in the world, the height they have attained being 5 feet higher than the tower of St. Nicholas's Church in Hamburg, which has hitherto been the second highest edifice. Ultimately they will be 51 feet 10 inches higher. The *Cologne Gazette* gives the following as the heights of the chief high buildings in the world: Towers of Cologne Cathedral, 524 feet 11 inches from the pavement of the cloisters, or 515 feet 1 inch from the floor of the church; tower of St. Nicholas, at Hamburg, 473 feet 1 inch; cupola of St. Peter's, Rome, 469 feet 2 inches; cathedral spire at Strasburg, 465 feet 11 inches; Pyramid of Cheops, 449 feet 5 inches; tower of St. Stephen's, Vienna, 443 feet 10 inches; tower of St. Martin's, Landshut, 434 feet 8 inches; cathedral spire at Freiburg, 410 feet 1 inch; Cathedral of Antwerp, 404 feet 10 inches; Cathedral of Florence, 390 feet 5 inches; St. Paul's, London, 365 feet 1 inch; ridge tiles of Cologne Cathedral, 360 feet 3 inches; cathedral tower at Magdeburg, 339 feet 11 inches; tower of the new Votive Church at Vienna, 314 feet 11 inches; tower of the Rathhaus at Berlin, 288 feet 8 inches; towers of Notre Dame at Paris, 232 feet 11 inches.

Anecdotes connected with Ventilating and Heating Arrangements. — A writer in a recent number of the *Sanitary Engineer* says: A large public institute near New York was heated with a hot-water apparatus, which proved quite satisfactory until one very wintry day word was sent to the contractor that the inmates were freezing. He came, and after listening to the trustees' complaints at the apparent failure of the apparatus explained that the heat from the boilers was neutralized by the enormous windows on the north side of the building, reaching from the ground to the roof and covering some hundred square feet of surface. The casings of these windows were so loose that the keen wintry blasts were forced into the rooms and then down the registers, so that the hot air was blown out of the cold-air supply box into the yard, melting the snow, and as an actual fact the inmates gathered around this out-door opening to warm themselves. The contractor said that if the trustees wanted more heating surface they could have it, but more fuel would be needed. He thought the simpler mode of remedying the difficulty was to put shutters on the windows. This was finally done, and no trouble has since been experienced. Here is another illustration of a popular ignorance. A gentleman while attending church one evening found that his feet were icy cold, so that he had to raise them from off the floor. Calling the attention of the sexton to the fact, the latter said with some perplexity, "Yes, we have a good many complaints of cold feet from others; but I can't understand the reason why we can't keep the church warm; we surely have fires enough." So saying, he pointed to a register in the floor directly behind the gentleman, in the adjoining pew. Looking around, the latter could see that there was a hot fire in the furnace beneath, and yet no heat came up. When a handkerchief was laid over the register it scarcely stirred. The visitor asked the sexton, "Have you any means of ventilation?" "No, sir." "Are there no windows open?" "None whatever." "How, then, can you expect the air to come in here if it can't get out somewhere?" There was no response; the man was nonplussed. "Did you ever try to blow into a bottle?" continued the inquirer. "No, sir." "Do you think, if you did, that you could force any more air into a bottle by blowing than was in it before?" He could n't say; never had thought of it. "Well," continued the gentleman, "you would soon find, if you tried, that it was impossible; and neither can you force air into this church through a register if you don't open a window or some other orifice." But, the sexton demurred, "opening a window would let in the cold air, would n't it?" "You just try it," was the response; "raise some of the windows on the leeward side of the church, and see what will happen." It was done; and instantly the handkerchief lying on the register rose half-way to the ceiling with the force of the ascending current. The sexton stood and stared in astonishment. "Now what you want to do," explained the visitor, who was a ventilating engineer, "is to keep your windows open, or to put in ventilators." He further offered to plan the latter free of charge to the church, and left his card for the trustees to call on him; but of course they never came near him, and I suppose cold feet are still the main attraction to the faithful attendants of this church, in spite of the red-hot theology preached there.

Duties on Works by the Masters. — To buy a picture by an old Italian master is one thing; to get it out of Italy is another. Report now comes that four pictures have been stopped on the northern frontier by the Italian custom-house authorities, who require that the enormous tax of twenty per cent on the value of the pictures shall be paid. This tax was imposed through Cardinal Pacca, in 1820, and is known as the Pacca Edict. After the Italian occupation of Rome the edict was looked upon as virtually annulled, and since 1870, up to ten months ago, pictures and other works of art were exported without being subjected to it. Now, however, it is revived. No other formality was observed than a notice by the Council of State in an official journal that the edict was again in force. A suit against the Government is likely to grow out of the case. Art-dealers regard the duty as very unjust, and with reason argue that the property is theirs, and that if the Government does not wish it to go out of the country, it should offer to purchase it, and not act the part of the dog in the manger.

Coloring Brass-Work. — Cleaned-up brass-work, if left in damp sand, is said to acquire a fine brown color, which, when polished with a dry brush, remains permanent and requires little cleaning. Black, much used for optical brass-work, is obtained by coating the brass with a solution of platinum, or with chloride of gold mixed with nitrate of tin. The Japanese are said to bronze their brass by boiling it in a solution of sulphate of copper, alum, and verdigris.

Ransome's Hydraulic Cement. — *Engineering*, in an issue of recent date, speaks highly of Ransome's hydraulic cement, which is shown by actual tests to be superior to good Portland cement. Mr. Ransome's first efforts were directed to overcoming the objections to using Portland cement for decorative purposes, for which it is unfitted on account of its color. He obtained a beautiful white cement, capable of receiving a polish resembling Carrara marble, by burning a mixture of kaolin, chalk, and soluble silica which he obtained from New England. After burning, the mixture was composed of 60 parts of lime, 12 parts of alumina, and 22 parts of silica. This product, though valuable for special purposes, was too expensive to compete with ordinary cement, and Mr. Ransome therefore began the use of blast-furnace cinder, granulated by Wood's patent apparatus. This slag sand, made at the Tees Iron Works, Middlesborough, was found to contain: —

Silica	38 25
Alumina	22.19
Lime	31.56
Magnesia	4.14
Sulphide of lime	2 95
Oxide of iron	0 91

The use of slag for cement is by no means new, large quantities having been turned out for years by Lürmann, at the Osnabrueck works in Germany; but it would seem that Mr. Ransome's method is capable of producing exceptional results. He reduces the slag to a fine powder, and after mixing it intimately with one to two parts of powdered chalk or limestone, burns it at a moderate temperature. The following results are given as developed by comparative tests: —

Age.	Breaking Strain of Samples 1½ inches Square, giving a Sectional Area of 2¼ Square Inches.	
	Portland (123 Pounds per Bushel) Pounds.	Ransome's Pounds.
2 days	510	740
3 "	608	870
7 "	818	1,170
12 "	–	1,3 0
15 "	–	1,330
21 "	–	1,440
28 "	936	
3 months	1,056	
6 "	1,176	
9 "	1,219	
12 "	1,229	
2 years	1,325	
3 "	1,314	
4 "	1,312	
5 "	1,306	
6 "	1,308	
7 "	1,327	

A New Varnish. — Some few years ago it was discovered in Natal, South Africa, that knives used in cutting down plants belonging to the natural order Euphorbiaceæ were protected from rusting by the gum which adhered to them. This led to further experiments being made with a view of utilizing the gum as a preservative material. Iron plates were coated with it and subjected to immersion in the waters of South Africa, which are stated to be proverbial for their foulness, and for the rapidity of the growth of vegetation. The euphorbia in Natal grows close to the seashore, so that there was ample opportunity for severely testing its value as a protecting covering for iron against corrosion and marine growth. The experiments proving successful it was then sought to put the discovery into a practical form. To this end the gum was dissolved in a preparation of spirits, and this was found to be a ready means of applying it as a coating for ships' bottoms, and for iron-work generally requiring such protection, the spirits evaporating and the gum being left on the surface of the metal. A sheet of iron coated with this preparation was placed in the waters in the Naval Dockyard at Chatham, where anything immersed becomes rapidly fouled. At the end of two years the plate was taken out and was found to be quite clean and free from fouling and corrosion. The composition has also been successfully tested in Africa against the ravages of the white ant. These successes have led to its adoption in practice for various purposes, and it is now being introduced in England. — *N. Y. Tribune.*

The Statue of the Republic at Paris. — The first competition for the Statue of the Republic which is to be erected at Paris has resulted in the selection of MM. Gautherin, Morice, and Sortoux, who are to be allowed until April, 1880, to prepare their full-sized models for the final competition.

Estimating for Shingling and Lathing. — If you wish to make an off-hand estimate of the number of shingles required for a roof at one quarter pitch, multiply the ground surface of the house in square feet by 10. Example, a house, 20 x 20 on the ground, has 400 square feet, multiplied by 10, gives 4,000 shingles; if it is one half pitch, add one tenth more. For a close estimate it is better to obtain the square feet of roof surface (after allowing four inches on each side for lap of gables, and 10 inches on each eave for lap over the moulding), then multiply by six, the product will give the number of shingles, laid five and one half inches to the weather. If 16-inch shingles are to be used, laid four and one half inches to weather, divide the square feet by nine and multiply the product by eleven. To estimate lath, allow 14 pieces to the square yard. In estimating, allow twelve inches for the base board, but include doors and windows. — *Northwestern Lumberman.*

Del Sarto's Madonna. — More recent reports from Florence go to show that the injury which Andrea Del Sarto's Madonna del Saco has received from a defective water-pipe on the outer wall of the Annunziata took place two years ago, when the fresco was in reality in worse condition than it is now, and that since then the pipe and roof have been thoroughly repaired.

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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A LETTER which our readers will find in another column brings up a question which we are somewhat surprised to see raised, — as to the meaning of the term "preliminary drawings." An architect who had furnished a number of such drawings, that is, of sketches which he supposed to be preliminary to a projected building, and who, when it was decided not to continue the work, sent in his bill, according to the ordinary custom, for one per cent of the intended cost, was told that the fee was not due, and that the drawings were not "preliminary," because "preliminary drawings were drawings made at the initiation of proceedings determined upon." This means, we take it, that an architect's first sketches are not preliminary unless they are made for work that a client has actually resolved to carry out, or at least as studies for the making of actual working drawings which the client has resolved to have made, if this last process can be called proceedings determined upon. In other words, sketches are not preliminary while the client is making up his mind, but become preliminary when his mind is made up; or, it may be, they never become preliminary unless his mind is already made up when he orders them. In these cases the questions occur, Do the drawings cease to be preliminary and the client cease to be bound to pay for them, if he changes his mind and decides not to go on? Or is a client bound to pay for such first sketches, if he first determines to go on and then changes his mind, but free if he never makes up his mind to go on?

THESE questions, however, are merely questions of the dictionary, and the expression "the initiation of proceedings determined upon" is as fruitful in them as the other. The real question is: What is it the custom of clients to pay for, and how much do they usually pay? The rest is simply the raising of dust. As a matter of fact, it is one of the common incidents of practice for a client to ask an architect to make sketches for a work in order that he may decide whether to carry it on or not, and it is the established custom to pay for such sketches at the rate of one per cent on the estimated cost, and to call them preliminary. It may of course be argued abstractly that "preliminary" means preliminary to work actually undertaken; but it may also be argued that it means preliminary to the client's decision, or that it means either, and may mean both. Its application in practice is not to be fixed by inquiring into its etymological or literary definition, but by examining its actual use as a technical term. So used, it is not applied with any such rigor as the definition we have quoted would require, but is actually and habitually employed to denote the drawings that are made to assist the architect and his client to determine, before a design is actually put into working shape, what its form shall be, whether it is ultimately put into such shape or not. Such drawings are made in order to save the expense and trouble of making more elaborate drawings, that may have to be altered, or that may not be used at all; and one of the special contingencies for which it is intended to provide is that of a client who wishes to be assisted in making up his mind whether to build or not, without being called upon to pay for a full set of plans. In the tariffs which are published by the English and American Institutes, not as enactments, but as records of established usage, it is set forth that the payment for preliminary drawings is due when they are furnished. This implies that they are to be paid for whether they are preliminary to any further work or not; for that cannot be determined, and is not fixed, till the subsequent work is done, while the payment is held to be due before it is done. In actual practice, payment is seldom asked for the preliminary studies at this point, unless the work goes no further, the payment for them being merged in the general commission. In other words, they cease to be paid for as preliminary just at the point where, according to the theory we are examining, they become preliminary. It is hardly worth while to carry our analysis further. The gist of the matter is that the applicability of the term "preliminary drawings," as it is actually used in the dealings of architects, is not dependent on the work that may come after it, though the term implies an expectation of such work. If there is exception to be taken it is on literary grounds, that the words are diverted from their literal meaning, as is apt to happen with technical terms; but this does not invalidate the custom, nor define it. Whatever misapprehension on this subject may prevail is likely to be due to the unfortunate habit of some architects of offering designs that are understood to be on approbation, which is quite a different thing from furnishing preliminary drawings.

IT is not strange if the Italians, hearing the cry raised behind them at the proposed rebuilding of the front of St. Mark's, have turned with counter accusations against their pursuers. The temptation to answer essentially, as the taunted school-boy does, "You're another," was under the circumstances too great to be resisted, and examples of countless English, French, and German restorations of the most remorseless kind were too conspicuous not to be flung back in retaliation. No better instance could have been furnished to their hand than the French treatment of St. Front, at Périgueux, the most marked example of French Romanesque, modelled directly on St. Mark's itself, which has been restored till it shines with the smug freshness of a Christmas toy. Nevertheless, it is to be remembered that those who have raised the cry, whether it be well advised or ill, are not those who are responsible for the restorations; and candid Italians will not excuse one error by another, or refuse to learn from the errors of foreigners. The reply of the Italian ambassador at London to an invitation to attend the opening meeting of the Royal Institute of British Architects, at which the question of St. Mark's was expected to come up, was irreproachable in tone; how much assurance it gives of an irreproachable treatment of St. Mark's is another question. After regretting that he was prevented from attending the meeting, he said, "My presence, or that of any member of the embassy, would be entirely superfluous, inopportune even, in view of the communications on this subject which have been published in the *Times*. These prove that, long before any agitation had shown itself in England touching this question of art and archæology, the Italian Government had seriously concerned itself with St. Mark's, and had taken energetic measures to preserve this unique monument from the ruin that menaced it, and to shelter from profanation the artistic wonders which it contains. Your society may be reassured, then; for Italy, which has been the cradle of the arts in Europe, has preserved the sentiment and the traditions of them. She does not leave it to any other to be more jealous than herself for the preservation of the artistic riches with which her soil is covered and of which she is justly proud."

THIS was a very effective reminder to the members of the Institute that they might devote themselves to their own business, but not in itself reassuring as to the fate of the building. The energetic measures of the Italian Government were the very things that filled with alarm the people who knew in what shape this energy was apt to show itself. Persons who believe that Italy preserves the traditions of the arts are not altogether agreed to believe that she preserves the sentiment of them, — or at least that her present sentiment for them has much sympathy with that of the season of her splendor. Indeed, a cynical person might suggest the question whether the arts, any more than men and women, were in their old age best provided for in their cradles. The members of the Institute, however, did not raise any of these questions, and the allusions to the church, both in the president's address and in the replies of members, were of a hopeful tenor, the secretary repeating the assurance he had gained in an interview with General Menabrea, that "the present state of the basilica involved not so

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much a question of restoration as of endurance." We are glad to hear it reported from Italy that the Government is agreed that the previous restorations of St. Mark's are not what they might have been, and to imagine that the protests which have been made, though they may not have been acceptable, may yet have some influence in putting the authorities on their guard against taking too energetic measures for the preservation of what remains.

The fire in the Park Theatre, at New York, last week, deserves to be mentioned as altogether phenomenal. An alarm was raised while a performance was going on, and it was found that a fire was burning under the main staircase in the principal vestibule. The presence of mind of the company and of the police officer who was in attendance, and the good behavior of the audience, avoided the serious misfortune which might have occurred. The officer promptly mounted a seat and admonished the audience to move deliberately and go out by the back exits, of which there were more than one. The house was cleared without disorder or accident. This gives one the encouragement of knowing that there are occasions when a theatre-full of people can hear an alarm without falling into a panic. The only parallel to it which we have noticed was in the Royal Theatre at Munich, where, some months ago, a fire having caught on the stage, the iron curtain was let down, and the spectators got out safely. We trust it will not be inferred from this that it is no great matter after all if a theatre staircase does take fire. Undoubtedly, if the fire had got far enough ahead to seem to put the spectators in immediate danger, they would have gone into uncontrollable panic. The stairways in theatres have shown themselves peculiarly liable to fires, — to be, in fact, the most likely places for it, next to the stage, — and this will continue to be the case so long as they are built of combustible materials, and the space under them is utilized for ticket-offices and store-rooms.

We have before this had the pleasure of introducing to our readers Sir Edmund Becket, Queen's Counsel, the friend of architecture and the prophet of restoration, who to his serious duties as barrister adds the diversion of disciplining the architectural profession in England. We have given some account of his Book on Building, of his vigorous forwarding of the restorations now going on at St. Alban's Abbey, of his fatherly correction of the leading architects of his country, and of the apparently futile attempt to appease him by making him an Honorary Associate of the Royal Institute of British Architects. The cares of chairman of the restoring committee of St. Alban's might naturally be expected to absorb most of the energy and attention that an active practitioner could spare from an exacting profession; but it appears that they do not. It is an old saying that whom the gods wish to ruin they first make mad. We do not know, of course, that the gods wish to ruin this clever barrister; but English people who are interested in such matters have been startled by the announcement that he has not only come forward with a proposition to meet the cost of restoring, or rather replacing, the west front of St. Alban's, but means to take it out of the hands of the Messrs. Scott, who have had the restorations in charge since the death of Sir Gilbert, and to assume the architectural direction of the work himself. The front, as we understand, will have to be substantially designed anew, excepting the interior porches, which are very beautiful, and could well be restored by a skilful hand. To the faithless it might appear that there was a blessing disguised under the opportunity given Sir Edmund Becket to extinguish his pretensions once for all under a conspicuous failure, were it not that the façade of a venerable cathedral is a costly subject for the experiment. But not unmindful, perhaps, of the adage *Fiat experimentum in corpore vili*, Sir Edmund has, by way of preliminary, already designed a rectory for St. Alban's, and it has been built. Illustrations of this, which it would be easy to ascribe to Professor Huxley's honest bricklayer, have been contributed, by some enemy it may be, to the *Building News*. Architects have, as might be expected, applied themselves with alacrity to the easy task of exposing its absurdities, and the author's confidence in his mission must be sublime if he is not led to regret his performance. It is devoutly to be hoped that the exposure of this exploit will make it impossible for Sir Edmund to wreak his architecture upon the front of St. Alban's. It is usually an evil day for a critic who has spent his strength in abusing the work of other people when his fate impels him to undertake to do it for them.

The imminence of the de Lesseps scheme for the Inter-Oceanic Canal has brought Congress to action, and the select committee of eleven authorized by the House of Representatives under the resolution offered by Mr. King, of Louisiana, was appointed before Congress adjourned. To this committee will be referred the whole literature of bills, memorials, and resolutions on the canal question that have come before Congress. It is expected to report a bill substantially like that introduced by Mr. Gibson, which again is, we believe, essentially the same as Mr. Acklin's, mentioned in our summary last week, for appointing a commission of five engineers to determine the best route for a canal. It was expected that representatives from the important commercial cities of the country would be appointed on the select committee, but this expectation was set aside, it is said, to make room for members who favored the application of the Monroe doctrine, and the great seaport cities are unrepresented. We may infer, then, that so far as the select committee is concerned the canal question will be considered from a political rather than from a commercial point of view, which is, we think, a thing to be regretted, especially if the political view is to be mainly influenced by the desire to push a political doctrine. The favorers of the Nicaragua route are said to be well satisfied with the composition of the committee. General Grant has been persuaded by a newspaper correspondent to give his opinions on the question of routes, and declares himself unreservedly in favor of the Nicaragua project, but does not commit himself to accepting the presidency of a company. It looks as if we were very likely to be committed to the Nicaragua idea, unless the Commission of Engineers, which we may hope to see soon appointed, should declare decidedly in favor of another. We may trust at least that the members of the commission will not be chosen with an eye to their advocacy of particular views. M. de Lesseps has published an article in the January number of the *North American Review*, in which he sums up the leading arguments in favor of his project, and the objections to the Nicaragua route, laying special stress on the ill adaptation of the latter scheme to the growing wants of modern ocean commerce with its great steamships, owing to its crooked watercourse and numerous locks. He argues against the applicability of the Monroe doctrine to a private enterprise in which, he says reasonably, if Americans do not have a controlling influence, it will be only because they will not subscribe to it, and he closes by adding "I do not hesitate to declare that the Panama Canal will be easier to begin, to finish, and to maintain than the Canal of Suez."

The New York *Times* is our authority for an account of the theories of Professor Fontaine, of Louisiana, which have just been printed at the Government Printing Office, by order of Congress, in two expensive quarto volumes that we have not yet seen. Professor Fontaine is a professor of theology and natural science, we are told; and we may surmise that, if his work had not been dated from a region that Congress desired to encourage, his work would not bear the government imprint. It is devoted to plans for draining New Orleans and reclaiming the adjacent lowlands, and to a discussion of the character of the Mississippi near its mouth. Mr. Fontaine proposes, for the drainage of New Orleans, to make use of what he calls the "suction" of a current of water flowing rapidly by the end of a submerged pipe. He would build a canal from Bonnet Carré Bend, above the city, carrying it eastward of the town to what is called England Turn, below it. This canal would be thirty feet wide by twenty-seven deep, and thirty-six miles long. Being ten miles shorter than the course of the river between its extremities, the canal would have a more rapid fall than the river; and this would be enough, Mr. Fontaine thinks, to give it a swift current. Into the bottom of this canal he would carry the city sewers, pointing their mouths down stream at an acute angle with the current, which by the suction he ascribes to it would exhaust the sewage from the pipes and carry it down to the river. This exhausting influence Mr. Fontaine calls his "discovery," and, desiring a name commensurate with its importance, he christens it *ekmuzesis*, — a word which our readers can find in their Greek dictionaries, — by which he simply means to cover the well-known principle that a current of air, water, or any other fluid passing over a submerged orifice relieves it of a portion of the pressure of the incumbent fluid, and so gives an opportunity for efflux due to the pressure on the other side of the orifice. This ekmuzesis could be only the difference, due to the velocity of the current, between the hydrostatic and the hydraulic pressure of the water; and if Mr.

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Fontaine should succeed in securing a velocity of four miles an hour in his canal it might be, so far as we can judge by a rough calculation, equivalent to six or eight inches of head, — that is to say, to that amount of pitch in his sewers. This is an advantage which would hardly compensate for the inconvenience of having the mouths of the sewers twenty feet under water, or aid much in solving the difficult problem of drainage for a city much of whose territory is often several feet below the actual level of the river; to say nothing of the discomfort of having all the sewage of a city of more than two hundred thousand inhabitants, lying in a hot climate, carried for several miles along its outskirts through an open canal of the dimensions quoted.

BUT Mr. Fontaine does not limit his ekmuzesis to this use. He proposes to apply it to the drainage of the ten thousand square miles of overflowed land about the mouth of the Mississippi. This process would lift Louisiana, in respect of her exchequer, above all the political communities of the earth; for by the sale of her reclaimed lands she could not only pay off her state debt, but reserve a fund sufficient by its interest to meet all her expenses and maintain her citizens in perpetual exemption from all taxation. We are not told by what system of pipes he proposes to carry off the large body of water which this implies. We may assume that the discoverer of ekmuzesis does not concern himself with the question of limits; but a professor of natural science might perhaps be expected to consider that a subaqueous "suction" which was strong enough to exhaust the sewers of a submerged city could be trusted to drain the surrounding land as dry as a squeezed sponge, without the intervention of any professors whatever. Mr. Fontaine further argues that the whole shore of the Delta is exposed to a great danger, inasmuch as the subsoil is less stable than the surface, while the current of the river is as swift at the bottom as at the top; so that it is idle to expect to save the banks from erosion by any such superficial appliances as dikes, embankments, or wharves. The city, therefore, is in a very precarious condition, from its danger of being eaten out beneath. Here it might be good for a professor to remember that if the tendency of the river had not been to deposit rather than to carry away material, neither New Orleans nor the ten thousand square miles which he wishes to reclaim would have existed at all. One may well tremble, however, to think of the erosion which would result if the discovery of ekmuzesis were once brought into action on the scale that is proposed. Such vagaries as these would hardly deserve notice, if they had been put forward by private hands alone; but when they come before us with the endorsement of Congress, and are published at the cost of the nation, they are entitled to attention.

THE MARBLE MARKET OF EUROPE.

THE extraordinary demand for Italian marble, which of recent years has grown up in the United States, has raised a question in the Peninsula similar to that which agitated the United Kingdom a few years ago with reference to its coal-fields: How long are the quarries likely to hold out against a consumption thus universal and increasing? It may be said, literally, that they send their supplies to all the civilized world — the more civilized the larger the request for this, the purest of human luxuries. It may very well be that other regions, and America especially, produce what are termed marbles in beautiful and almost countless varieties; but, the Grecian quarries excepted, the Italians have practically no rivals in furnishing the material of sculpture, and it is well known that for a considerable period past the Greek rocks at Pentelicus, Paros, and elsewhere have been hewn down — the former, however, less so than the latter — as it were to their very roots. Elsewhere, throughout the New World, — in the States, in Peru and Mexico, in the capitals of the small republics, — wherever, indeed, modern magnificence in the North has outrivalled ancient splendor in the South, are to be found superb flights of steps, colonnades, altars, mantel-pieces, cornices, and so forth, of "native marble;" yet, would Hiram Powers, or any other artist, have ventured to work upon any of it, however brilliant, for the purposes of his studio? The answer is given in the continual importations to which allusion has been made, and not the Italian quarry-owners merely, but the Italian Government also, are naturally anxious to ascertain whether there appear to be any probable or near limits to this historic source of the national wealth. We are assisted, indeed, in the consideration of the subject by several reports which have been addressed to the minister in charge of interests belonging to this class, as well as by details in the columns of the journal more especially representing them. In vain has the earth been searched for new beds wherefrom may be chiselled statues such as those that are the glory of the temples and palaces of antique Greece and Rome. They seem to have no existence. A superabundance is ready at hand for balconies, balustrades, church-fonts, pulpits, consoles, cloister decorations, "credence, cross, and cave," for pavements, fountains, mosaics of the nineteenth-century kind, tombs, vases, and all else and sundry of the miscellanea entering into the necessities of public and private ornamentation in our day; and even were these supplies to wholly or partially fail, the art of imitation has been carried so far that the failure would scarcely be felt. Already is "artificial marble" extensively employed in the building of Italian churches. A patriotic instinct led those who reared the column of July, in Paris, to seek their materials in the native quarries of Franchemont, while some inferior French sculptors have directed their choice of necessity to those of Gabas, which really yield a perfectly white and exquisite stone, possessing, however, few of the qualities which gave a kind of mundane immortality to the works of Phidias and Praxiteles. There are marble quarries, moreover, in Belgium, largely productive and contributing much to the architecture in the newer quarters of the Belgian towns, as there are, indeed, in our own island of Anglesea, though the designation bestowed upon them is somewhat ambitious. Those near Vichy are, in many respects, not far removed from the true Italian, but have rarely found their way into the studio; while the splendid specimens in the Napoleonic Hospital, at Berck-sur-Mer, were derived from a number of localities, the precise names of which have not been put upon record. In southern France, again, as at Toulouse, endeavors were made a century ago to utilize, for the higher purposes of art, the produce of the local quarries; but the idea had to be abandoned. There is no second Pentelicus, no new Carrara, to be hoped for. With respect to Greece, there is little reason to doubt that her riches of this description, although the classic quarries may have been nearly wrought out, are far from being as yet exhausted; they are simply neglected, and, according to the French Geological Survey, conducted by M. Albert Gaudry, the plain of Pentelicus still rests upon a bed of such marble as that of which the Parthenon, the Temple of Theseus, and the other glories of the Acropolis were constructed. The old quarrymen, in some places, scarcely did more than scratch the face of a naturally scarped hill rising on the edge of the main level, extracting a block here and a block there, to satisfy some exigency of their employers, an entire excavation not unfrequently representing no more than a solitary monolith extracted. Often, too, having half-accomplished their work, they discovered a flaw, and abandoned it. Many of these rejected fragments, we are told, remain to this day, partly hewn, and partly clinging to the parent rock. Through this rock may yet be seen the hollowed way down which the marble was transported to the workshop of the architect or the studio of the sculptor. M. Gaudry found there an enormous drum, of the purest material, evidently designed to form part of a column for some mighty edifice, but which never had been removed from the place where the quarrymen had left it. On the other hand, wanton and barbarous requisitions were made here to supply materials for the palace of Otho, late King of Greece, and for other pretentious edifices belonging to his reign in modern Athens. The Turks, too, left marks of their ravage on Pentelicus. Nevertheless, if the report of the French Geological Commission be not exaggerated, there yet remains a considerable surface and depth of the true Pentelican marble unworked — excellent news for artists, should the statement be verified; but no exact measurements are given, and no statistics whatever. The Pentelicus of the year — a very recent one — in which M. Gaudry visited it was in process of being hewn to fragments by speculative builders from the capital.

At Carrara there is, at least, more method observed in the devouring process, but it is none the less exhausting. A little community of sculptors is established round the quarries; the work of the artist's chisel goes on within a few yards of the marble-mason's saw; statues, bas-reliefs, capitals, and columns are perpetually being turned forth at a rate which unquestionably threatens that the supply will be of no very protracted duration. An absolute reign of waste appears to have been established in this domain of marble. A late traveller was assured on the spot that hundreds of tons annually were needlessly thrown away in needless chipping and superfluous dust. Besides this, valuable blocks are every now and then ruined by the clumsiness of the workmen, or, at any rate, have to be cut up into smaller and therefore less valuable fragments, so that a supply which might last indefinitely is recklessly consumed without the remotest reference to the future, and only in the prospect of immediate gain. Marvellous, however, must have been the wealth of this narrow region in one particular material, when it is considered that this war, so to speak, upon the rock has been going on, almost without intermission, since the days of the Roman Empire, though that there was a gap historians are agreed and the neighboring ruins attest. Yet, when it is remembered that Canova the Venetian and Thorwaldsen the Dane received their artistic education within sight of these quarries, a greater wonder is that they are not more sedulously cared for, or, in a sense, "preserved." But the material whence the Venus of Milo and that of Medici, the Antinoüs, the Bacchus, and the Mercury, which have been the delight of ages, were fashioned, is now actually sold by the hundred-weight and ton as though it were no more priceless than is the mock alabaster of Volterra. One deplorable circumstance is that so much of it is removed, in colossal masses, for the decoration of commonplace, albeit gorgeous, edifices of the nineteenth century, with the result that what might have furnished the principal splendor of a gallery at Rome or Florence may serve as the pavement of a vulgar vestibule, or the

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coping-stone of a wall. The Italians themselves are beginning to become sensible to this reproach, at once upon their national spirit and their reputation for foresight. The Carrara quarries once exhausted, or near exhaustion, and a large money-spending colony will quit their shores. It is a sort of opulence which cannot be renewed. There are other marble rocks in the vicinity, it is true, as that, for instance, of Colonnata; but the Colonnata quarries have never been held in equal, or even similar, esteem, and will not serve as a refuge to fly to when the "crystalline white," once so abundant in their neighborhood, has disappeared. Not a few of the rocks, it should be remarked, have already ceased to yield the material for statuary, while, although the huge calcareous masses rising in every direction around appear to promise an unbounded store for the future, it is well known that they may be pierced far and wide — a certain Vandal once suggested blasting — without a bed of the pure, veinless, almost imperishable sculptor's marble being found. About £50 a cubic yard is considered an average price, apart from the cost of quarrying and transport; but it is not surprising that the tariff rises from year to year. An illustration is afforded, close by, at Palvaccio — once famous, now absolutely desolate. The marble there was literally blown out of its bed by gunpowder, five or six mines being exploded at a time, until a multitude of formless masses almost choked the valley; and the practice, monstrous though it be, is not unknown at Carrara itself, or in the contiguous quarries of Seravazza. It may be a long time, of course, before the world is compelled to put up with the French invention of "artificial marble," which is no more than a species of stucco, although, as we have said, it meets with considerable acceptance among modern Italian church-builders, who pretend that they can quote precedents from the Basilica of St. Lawrence, Saint-Etienne-le-Rond, at Rome, the Ara-Cœli, Saint Martin of the Mountains, and the Church of the Four Crowned Saints; but in these the term is a misnomer, applied to work of a totally different kind, being used merely for incrustation where surfaces have to be concealed. It is much more to the purpose to know that the merchant-princes of Holland, a country almost destitute of stone, and wholly destitute of marble, frequently adorn their mansions, under the directions of French architects, with stairs and balustrades of Carrara marble, and that at Berlin, Vienna, and Munich a similar prodigality is not rarely to be met with. At this very day the Sultan of Turkey and the Viceroy of Egypt transmit orders to the same quarries, for the decoration of palaces which they never inhabit — not jewel-worked specimens merely, but lofty pillars and balustrades for spacious galleries. It is not, indeed, every ruler who goes to the excess of the First Napoleon, and insists upon the employment of this material, rapidly dwindling as it is, in the building of a barrack; short of this, however, the principle of the waste going forward is very much the same. The ancients decreed at one time, when their art-genius was at the highest, that neither Carrara nor Pentelicus should be quarried except by the architects of temples; but now the market is for all the world. The Italian Government, it is true, did once hint at a protectorate over these treasures; but nothing more has been heard of the measure. Meanwhile, the Italians profess to be alarmed lest America should compel them to work out their imcomparable quarries. — *The Building News.*

OLD ST. PAUL'S, LONDON.

[The following extracts are from a report in the *Building News* of a lecture by Mr. Edmund B. Ferry, F. R. I. B. A.]

Until the seventh century the site was occupied by a temple of Diana, but in 603 Bishop Melitus founded a church on the site, of which nothing was known but that it or its successor was destroyed by fire in the time of William the Conqueror. In 1083 a most magnificent structure, with a large vault, was commenced on the site by Maurice, Bishop of London. Old St. Paul's might be compared with the contemporary cathedrals of Ely, Peterborough, and Norwich, all simple cruciform structures, with Early Norman naves, each flanked by a single aisle both north and south, and originally covered in with flat boarded ceilings; the choirs of all four were probably apsidal, but were removed at a later period. The revaulting of St. Paul's nave was commenced about 1100 by Bishop Belmeis, and was probably of wood, as was then common — a mode followed the other day by Sir Gilbert Scott at Chester. In 1136 the cathedral was greatly damaged by fire, and again in 1221. These injuries were repaired and the transepts carried on, and in 1236–40 Bishop Niger, a great benefactor to the building, commenced the choir, which, however, was not the one illustrated by Hollar, so completely was it recast in the fourteenth century. About 1250 the beautiful flying buttresses were added, and the cloister laid out. The transepts were recased, and had the unusual feature of both east and west aisles. The central lantern, the finest feature of the cathedral, was added to, and at length capped by a lead-covered spire of great height. The measurements varied greatly, the lowest being that of Wren, who calculated it to be 50 feet higher than that of Salisbury. Bishop Maurice's great undercroft seems never to have been destroyed, and consequently on leaving the long nave of a dozen bays there was an ascent of twelve steps to the choir. In 1256 the cathedral was enlarged by throwing into it the Church of St. Faith, which had stood above ground, and for which part of the undercroft was substituted as the parish church — an arrangement followed by Wren. In 1332 the chapter-house was commenced in the middle of the cloisters, which occupied the angle between the nave and south transept. Mr. Penrose had had the site cleared, but all would agree with him that the masonry found *in situ* was not that of the fourteenth century, but of a later reconstruction. The cloisters were double-storied, as at one of the Leicestershire priories, at St. Stephen's, Westminster, and at Burgos, Spain; but the central position of the chapter-house seems to have been unique. It was an octagonal structure with great buttresses, and only 40 feet in diameter, whereas those yet existing at Westminster and Lincoln, which were similar in plan, were nearly 60 feet in diameter. In 1444 the lead-covered spire was struck by lightning and burnt, but was repaired eighteen years afterwards; in 1561 the restored feature was totally destroyed by another fire, and although the roofs were repaired nothing was done to this feature. The old cathedral seems in the fifteenth century to have presented a sumptuous appearance, with its rich hangings, painted glass, images, and monuments, although never equal in the last respect to Westminster, but all the decorations were swept away in the reign of Edward VI. In 1633 Inigo Jones commenced his celebrated porch, as the first of the series of alterations intended to completely Italianize the cathedral. The transepts were so altered, and then the nave, but the choir remained in all its Gothic beauty to the very last. In 1642 the old cross was pulled down, and after the Restoration the desecration of the building was carried to a scandalous pitch. From 1663 till the very moment of its total destruction, three years later, extensive repairs were carried out by Wren. Indeed, from the descriptions of the difficulties encountered in blowing up and pulling down the old walls after the Great Fire, it might be questioned whether, if such a calamity had occurred in these days of restoration, it would not have been comparatively easy to repair the damage; but, as they all knew, other counsels prevailed, and in 1672, after consideration of alternative designs, Wren's new cathedral was commenced. Although in an early edition of "Stowe," Hollar referred to the "western towers," it was clear, from a consideration of the ground plan, the old drawings, and the excavations on the site, that these adjuncts were never carried out. At the east end of the churchyard was a detached bell-tower, as at Chichester and (within modern times) at Salisbury, and this was capped by a leaded spire, and contained four immense bells. On the north side of the choir was Paul's Cross, an open-air pulpit, from which many famous sermons were preached, and on the north side of the churchyard was the charnel-house, consisting of a vault with chapel above. This was first mentioned in Henry VI.'s time, and was pulled down in the time of Edward VI. To the north of the cathedral was a chantry, to which was attached a second cloister, wherein many monuments were displayed, and adorned with frescoes of the Dance of Death — a Campo-Santo, in fact. A library was built by Bishop Sherrington over one part of the cloister. As Hollar unfortunately did not represent any of these buildings we could not see what they were like. Adjoining the south side of the west entrance to the cathedral was the Church of St. Gregory.

As there were no western towers, the whole effect of the long choir, of the still longer nave, and of the greatly projecting transepts, with low aisles outside, was pyramidalized to the eye by the beautiful central lantern and the glorious spire above the great square tower which rose from between the roofs and flying buttresses. The nave of twelve bays, with its pinnacles and buttresses, must have been very fine indeed in its extent and proportions, both without and within. The plain Norman arcades, separated by a span of 38 feet, and the vaulted roof, led on to the more ornamental transepts, and these prepared the eye for the rich choir. It was probable that the east aisles of the transepts were chapels, and the western ones vestries. Between the buttresses, though, were chapels, and at the west end of the nave the consistory court was to the south of the entrance, as at present. In this nave was a rich altar tomb to Bishop Kemp, between the second and third columns of the north arcade, and in the eastern bay on the south side was a monument to Sir Thomas Beauchamp. The total number of monuments was, however, very small for a cathedral. The whole length of the cathedral was variously stated, but appears to have been about 596 feet. Proceeding under the lantern, eastward, the limb was divided into a choir proper of four narrow bays and a presbytery of three bays more, the other five bays forming a Lady Chapel. The tracery of the windows in the constructural choir was of Decorated character of at least three or four patterns. In the north wall of the presbytery was a series of tombs of Saxon kings, and just to the north of the altar was the monument of John de Gaunt. In the north wall were the treasuries, and there were many little chapels in the external walls, supported by arched bridges thrown across the window heads of the undercroft. The whole cathedral was marked by simplicity and proportion in the plan, and depended for its magnificent effect upon the multiplicity of parts, the variety of styles introduced, and the splendor of its altars, chapels, and fittings.

THE ILLUSTRATIONS.

"T CHAPTER HOUSE AT ANN ARBOR, MICH. MR. W. L. B. JENNEY, ARCHITECT, CHICAGO, ILL.

"THE CRAIGS," DESIGN FOR A HOUSE AT MT. DESERT, ME. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

THE CATHEDRAL AT LIMBURG-ON-THE-LAHN.

In explanation of the view of the cathedral and cathedral town we print the following account, which like the illustration is taken from the *Builder:* —

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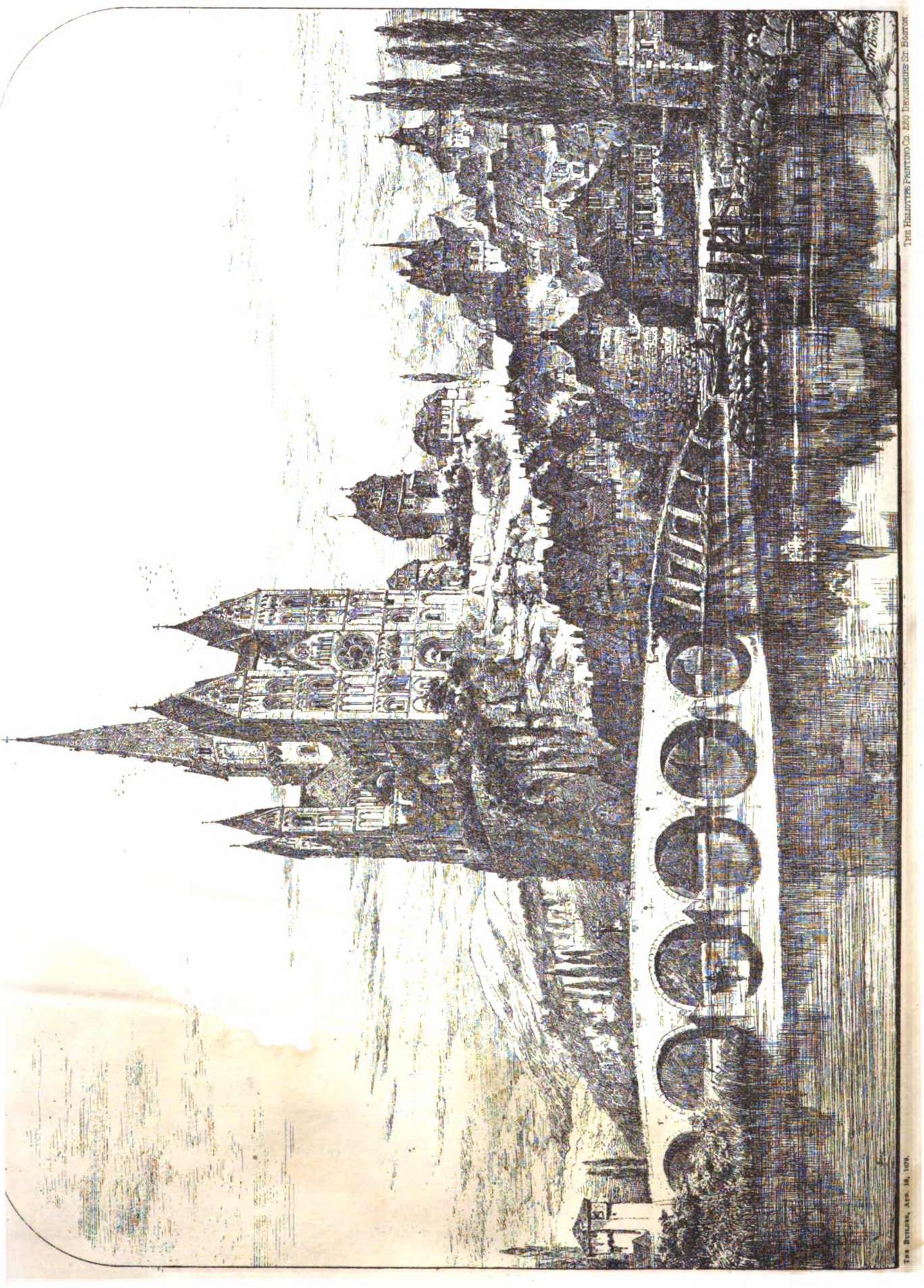

LIMBURG-ON-THE-LAHN, GERMANY.

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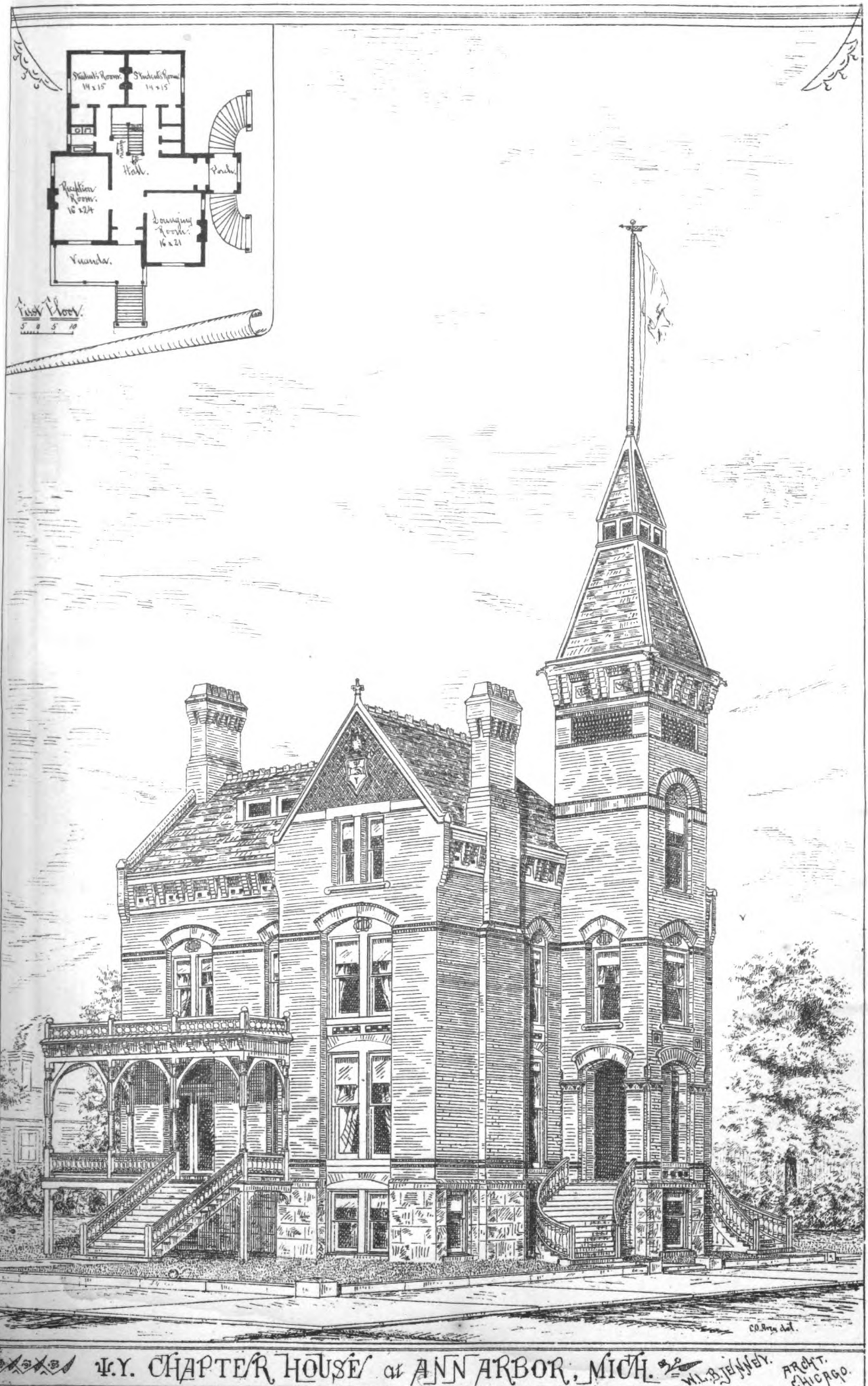

Y. Y. CHAPTER HOUSE at ANN ARBOR, MICH. W. L. B. JENNEY. ARCH'T. CHICAGO.

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Rising quite precipitously from the river Lahn is an escarped rock, the opposite side of which has been cut away into a series of terraces, which gradually descend to the level plain. On the very edge of this precipice is placed the cathedral, or, as it was formerly called, the Collegiate Church of St. George. So close, indeed, is it to the escarped face of the rock that the buttresses of the north transept are exactly flush with it; and in the dim light of the evening it is impossible to see where the church begins and the rock ends. This method of "broaching" a church down on to the rock upon which it stands was a very favorite device of the Middle Ages at Limburg, Mont St. Michel, Durham, etc. The church seems to run down into the rock, and the rock to run up into the church; so that the effect is as though some vast rock had been carved and shaped into a church. The power this gives to a building is wonderful. Instead of, as is so often the case with buildings now, the site being a difficulty, it is made to add enormously to the dignity of the structure which stands upon it.

Most modern architects or builders, if they had such a site as that of Limburg Cathedral to erect buildings upon, would commence by cutting the rock down, so as to gain a level platform for the buildings to rest upon; but it seems that the mediæval men never did this. Whenever they did anything with earthwork, it was to pile up — never to cut down. The idea of levelling a site seems never to have occurred to them; and if they wanted to put a building down upon a certain spot, they do not seem the least to have cared what was in the way. At Würzburg there is a church, the west end of which is built over a stream, and the east end over a road. At Dottelbach, the town-hall has a river running under it from north to south, and the principal street of the town from east to west. Probably the Germans were more daring in this respect than any other mediæval builders. The fact is, they seem to have delighted in overcoming difficulties; and if there were no difficulties to be overcome, they sometimes seem to have almost gone out of the way to make them. That spirit of "adventure" for which the Middle Ages were so remarkable, that dislike of what was vapid or commonplace, that restless activity of mind always in search of the wonderful, longing for the supernatural and the mysterious, entered largely into their buildings and their choice of sites for their towns and churches. It may, of course, be advanced that defence had a good deal to do with the question; but no ideas of this kind could have dictated the choice of such a site as that of Limburg on-the-Lahn, because there is immediately to the east a lofty hill with sloping side, and thus easy of ascent, which completely commands the town.

Perhaps no town in Germany possesses so romantic an appearance as Limburg, when viewed from the river. Seen from the west, with the cathedral crowning the eminence, and the gables of the houses forming an intricate foreground, its simple but striking fourteenth-century bridge spanning the river, and lofty hills filling in the background, it is difficult to imagine a more charming scene than this quaint old city presents. Nor is the view from the east in any way less beautiful; for here the noble apse of the cathedral rises over some interesting ancient collegiate buildings, a picturesque old mill and some willows group themselves charmingly about the base of the rock, while, far above everything else, the seven graceful spires of the cathedral shoot up into the sky.

The restoration of such a church as the Cathedral of Limburg-on-the-Lahn (for this beautiful building is at present undergoing a restoration) must under any circumstances be an excessively hazardous and dubious undertaking. The building in its present condition looks so exceedingly beautiful, from the exquisite tints which age has given to its surface, and forms such a strikingly picturesque object when seen in combination with the rock upon which it stands, the river which flows past it, and the highly interesting ancient buildings which surround it on every side, that an architect ought to think long and ponder well before he attempted to do anything which might mar or interfere with a scene so charming and a combination so highly picturesque and interesting.

Now the reports which have reached us from trustworthy sources lead us to suspect very strongly that those engaged in the restoration of this beautiful church have not given sufficient weight to the considerations which we have previously suggested. We are told, for instance, that it is decided that the curious gallery which unites the two western towers shall be removed. These galleries, uniting the towers of the German churches, are very interesting features, and are, if we mistake not, peculiar to Germany. They are also found almost exclusively in churches of an early date, — such, for instance, as Limburg Cathedral, the Church of Boppard (where it has been recently destroyed), the church at Dietkirch-on-the-Lahn, St. Dionisius at Esslingen (Mr. Webb, in his Continental Ecclesiologist, describes the towers of this church as being united by two galleries, one above the other; if this was the case, one of these galleries has disappeared), the Cathedral of Aix-la-Chapelle, and many other churches of a Romanesque date. It is true that such galleries are occasionally found in churches of a later date, but rarely. It is probable that the galleries now existing in the churches we have mentioned are not coeval with the towers which they unite, but we have little doubt that they replace others that were; and the fact that these galleries are represented in most ancient views — especially those in the Nuremberg Chronicle, a work published in the year 1493 — proves beyond all question that these galleries were in common use previously to that time. In the work alluded to (the Nuremberg Chronicle) there is not a single representation of a church with Romanesque towers, which is not furnished with one of these singular galleries. One of the uses of this gallery or bridge is obvious enough. It of course saves the expense of a staircase in both towers. It also saves the trouble of going down to the ground and mounting another staircase when it is necessary to go from the bell-chamber in one tower to that in the other. We may venture to hazard a third use. There can be no doubt that at all times during the Middle Ages church-towers were used in extreme cases as places of defence. They were, in fact, the very last stronghold of the besieged; and church-plate, valuables, manuscripts, etc., would, in case of necessity, be placed in the tower which had no staircase. The wooden bridge or gallery could easily be thrown down, and they would be placed in a position almost inaccessible, for a time at least. With regard to the picturesqueness of this singular feature of ancient German ecclesiastical architecture, there cannot be two opinions; and even were it not so, its very singularity ought to plead for its preservation. This being the case, we cannot conceive what can induce the German architects to destroy this feature whenever they can get an opportunity of doing so. We fear this mischievous propensity may be traced to that hard, inartistic spirit of "purism" which renders German restorations and modern German architecture so dry, cold, and thoroughly uninteresting. If a German architect has to restore a Romanesque church, he considers it his duty at once to destroy every feature which is not Romanesque. If it is a First-Pointed church which he has on hand, everything which is not First-Pointed work must go, and of course anything like Rennaissance furniture must be swept away as something too abominable to contemplate for a moment; and thus most German churches, when they are restored, are robbed of the whole of their interest, and might just as well be entirely rebuilt from the ground. This is the case with the Abbey Church of Laach, the Church of Sinzig, the Cathedral of Speier, St. Godehard, Hildesheim, and many other churches which we might mention. Now it is just such a fate as this which we dread for the Cathedral of Limburg-on-the-Lahn. It is only just to say that all German architects are not imbued with this mischievous purist spirit; for a more conservative restoration than that of the Cathedral of Paderborn, under Mr. Guldenpfennig, it has rarely been our fortune to see.

Another thing which is being done at Limburg is to be seriously reprehended: and that is, the removal of the singular old screens which cut off the transepts from the choir. We understand that these screens are to be reërected in the arches of the apse; but here they will do exactly what they are not wanted to do, — that is, they will block out the view of the aisle which surrounds the apse.

THE OLD UNITED STATES CAPITOL.

THE Capitol was pronounced completed in 1825. The two wings, which were the only portions of the building finished when the British occupied Washington, were burned with their contents, including the congressional library and some works of art. When Congress was convened in special session after the invasion, the two houses assembled in the unfinished hotel previously mentioned, but soon occupied a brick building erected for their temporary use, which was afterwards known as the Old Capitol Prison, and has more recently been reconstructed into dwelling-houses. The Capitol was completed under the direction of Mr. C. Bulfinch, a Boston architect. The freestone columns for the central porticos of the building were quarried on Higginson's Island in Acquia Creek, near where it empties into the Potomac, brought to Washington on a large, flat-bottomed boat, and dragged to the Capitol by men, many of the senators and representatives pulling at the drag-ropes.

The tympanum of the eastern pediment was ornamented by a historical group, which Mr. John Quincy Adams designed when Secretary of State, after having rejected a number of designs made by artists in competition for an offered premium of $500. It was executed in marble by Luigi Persico, an Italian sculptor, whose work gave such satisfaction to Mr. Adams that he secured for him an order for the two colossal statues which now flank the central door-way. War is represented by a stalwart gymnast with a profuse development of muscle and a benign expression of countenance, partially encased in ancient Roman armor, while Peace is a matronly dame, somewhat advanced in life and heavy in flesh, who carries an olive branch as if she desired to use it to keep off flies.

The then recently completed *rotunda* of the Capitol — Mr. Gales took pains to have it called rotundo in the *National Intelligencer* — was a hall of elegant proportions, ninety-six feet in diameter, and ninety-six feet in height to the apex of its semicircular dome. It had been decorated with remarkable historical bas-reliefs, by Cappellano, Gevelot, and Causici, three Italian artists, two of them pupils of Canova. They undoubtedly possessed artistic ability, and they doubtless desired to produce works of historical value, but they failed ignominiously. Their respective productions were thus interpreted by Grizzly Bear, a Menominee chief. Turning to the eastern door-way, over which there is represented The Landing of the Pilgrims, he said, "There Ingen give hungry white man corn." Then turning to the northern door-way, over which is represented William Penn making a treaty with the Indians, he said, "There Ingen give white man land." Then turning to the western door-way, over

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which is represented Pocahontas saving the life of Captain Smith, he said, "There Ingen save white man's life." And then turning to the southern door-way, over which is represented Daniel Boone, the pioneer, plunging his hunting-knife into the heart of a red man, while his foot rests on the dead body of another, he said, "And there white man kill Ingen. Ugh!"

The rotunda was then also ornamented by the four historical paintings which now adorn it, by Colonel Trumbull, who was employed by President Adams to clean and varnish them. They are not works of high artistic merit, but in all of them the portraits are accurate, while the costumes and accessories are well made out, and executed with a fidelity that will make future historical painters rejoice. Pecuniarily speaking, Colonel Trumbull's paintings and the copper-plate engravings of some of them did not pay. How often the artist must have remembered in his old age the reply of his father, when he solicited permission to go to London and study under West, instancing as an argument the glory and reward of the Athenian artists in the days of Pericles. "My son," replied Governor Trumbull, "America is not Greece."

In 1826 the sons of Benjamin West offered to Congress for a nominal sum one hundred and thirty-nine pictures by their distinguished father, as a nucleus for a national gallery of art; but the offer was not entertained. The following year more consideration was paid to a proposition that Washington Allston be engaged to paint the battle of New Orleans for one of the vacant panels in the rotunda. A protraeted debate ensued, and attempts were made by the anti-Jackson men to take away the exclusive character of the resolution by adding other battles as subjects to be painted; but all of these failed, and a square vote was taken on the original proposition, which was defeated by a vote of ninety-eight yeas against one hundred and three nays. It was during this debate that John Randolph, who had in years past eulogized Colonel Trumbull's paintings, unmercifully ridiculed them. In closing his scathing criticism, he said, "As all other great subjects had their *nom de guerre*, the Declaration of Independence should be called *the shin-piece;* for such a collection of legs never came together in any one picture."

When Congress was in session, the rotunda presented a busy and motley scene every morning prior to the convening of the two houses. It was a general rendezvous, and the newspaper correspondents were always in attendance to pick up the floating rumors of the day. Office-seekers were rare at Washington in those days; but there were always a few impecunious, moribund politicians to be found in the rotunda.

The library, on the western side of the rotunda, was the morning rendezvous of the ladies who were acquainted with the congressmen. The original library having been carefully burned by the British, ex-President Jefferson had improved the opportunity to relieve his pecuniary needs by the sale of a portion of his library for $23,950, which was a high price for the seven thousand five hundred volumes. The classification of Mr. Jefferson was retained, and the books were arranged on shelves in twelve alcoves, each one devoted to a particular topic.

The Senate Chamber, now occupied by the supreme court, was admirably adapted for the deliberations of the forty-eight gentlemen who then composed the upper house. Modelled after the theatres of ancient Greece, it possessed excellent acoustic properties, and there was ample accommodation in the galleries for the few strangers who then visited Washington. The senate used to meet at noon, and generally concluded its day's work by three o'clock, while adjournments over from Thursday until the following Monday were frequent. Occasionally set speeches would be made on some important question; but the debates were generally colloquial, and as there were no verbatim reports of the proceedings, senators would change or modify placed their views during the consideration of a bill without being on the record as inconsistent and changeable. — *Atlantic Monthly.*

SPONTANEOUS COMBUSTION.

The attention of fire insurance companies has recently been called to spontaneous combustion as the probable cause of a large number of the fires which are usually set down to the credit of "unknown" causes. Fresh facts have been adduced to substantiate this theory. Bodies hitherto believed to be as incapable of self-ignition as a ship's anchor are shown to have the secret power, under certain conditions, of bursting into flame, like the heart of a susceptible maiden of eighteen summers. Common wood is one of these things. An instance occurred in the laboratory of the French Academy of Sciences, as a result of the action of a current of air at a temperature of seventy-seven degrees upon some boards over which it passed. A serious conflagration was only prevented by the fortunate presence of somebody to squelch the blaze, as Sir Boyle Roche would have said, "in the bud." Pulverized charcoal will often ignite without provocation, or very little. This is owing to its power of rapidly absorbing oxygen. The woodwork of a house after long exposure to hot, dry air is reduced to a condition similar to that of powdered charcoal, and will swallow oxygen with perilous avidity. No doubt many "mysterious" fires originate in this way. A certain insurance writer thinks it may be safe to go further, and assume that the spontaneous process is the incitant of a majority of the fires which destroy barns and other farm-buildings through the long dry weeks of summer. At all events it is a comfort to believe so, on account of the additional respect it enables insurance men to feel for bucolic human nature, under conditions which tempt it to the commission of the crime of arson.

Other substances still are of a highly combustible character. Bituminous coal is entitled to a high rank among them. When left lying in large heaps, or loosely stowed in the holds of vessels, it often flames up like a nervous woman on washing-day. This comes of the violent and unlawful action of dampness on the sulphuret of iron, with which ingredient this form of coal is a deal too heavily endowed. The cases of the spontaneous combustion of a sofa in Manchester and of a mattress in Leamington have been already published for the enlightenment of insurance agents. Fires in beds have occurred from the same cause. Disagreeable as it naturally must be to be awakened from a sound slumber by a fire in one's bed, a wise man will presently arise and inquire into the cause of this domestic phenomenon. Doubtless a neglect to do so on the part of very stupid or wilful persons has often produced much trouble to coroners' juries. and expense to the underwriters. Closely packed sugar-boxes will sometimes burn spontaneously, and so will certain woollen cloths that have been "treated" with oil to render them waterproof, or to increase their weight. Quicklime exhibits the same ridiculous tendency. — *London Review.*

THE ALBANY CAPITOL.

Atlanta, Ga., December, 1879.

To the Editor of the American Architect:

Dear Sir, — *Scribner* for December contains a paper headed, "The Capitol of New York," illustrated by a series of most admirable specimens of the engraver's art, giving a condensed history and criticism of the building, especially its details. The historical part, however, touches only what happened before the scenes; it does n't go behind them. We are informed of how "chapter after chapter" of the A. I. A. protested against a change of style, etc., etc. We receive some sage advice and information regarding styles, etc. The *American Architect and Building News* is quoted as saying: "The building gained very seriously by the change of architects." (I read the article referred to, and was amazed; looked over all the drawings once again, said, "Boston is the Hub," and gave it up, wondering whether, when you came to that conclusion, the old design got a fair show, — whether you seriously compared the old and new domes, and recognized what we lost in the old design in making up the balance for the new.)

On reflection, I thought it advisable to give a few thoughts on the subject. In advance, however, of what I shall say, I would like to have three points understood: First, I am not a literary man; second, the "Queen's English" is not my native tongue, and I never studied it; third, there is a difference between criticism, fault-finding, and mutual admiration. I have nothing to do with the two latter.

In the article referred to, "the accumulated experience of centuries" is made light of. To me it appears that he who ignores it invariably puts himself on a par with the negro who loads up the wheelbarrow, and then puts barrow, load, and all on his head, and carries it to its destination.

Purity of style means the perfect harmony of all the parts in architectural form, the fitness of the whole for the purposes it is intended to serve, — a problem solved by the ancients in the periods and countries to which the various styles belong. They differ from each other necessarily as the civilization, culture, and taste of one people differ from those of another. Each time and country has its own peculiar idea of beauty. Each style is *quasi* a reflection of the *cultus* of its time and people. The aim at the perfect brought mankind from one style to another, as the tastes and conditions of men gradually changed. Whenever a new style, different from its forerunner, became a harmonious whole, a new epoch was marked in history. Now as it necessarily took centuries of time to get clear away from one style to another, we find a considerable amount of transition work, and at times, especially in the Dark Ages in Europe, a serious retrogression is notable, until about the tenth century, whence, rising to the thirteenth, man once more asserted by his works in architecture that he is an intellectual being; and, by the fifteenth, had nearly completed some of the grandest works on the face of the earth. With the Roman Empire its civilization and mythology perished, and in its stead arose the Christian religion and civilization, which pointed the mind of man heavenward. Hence the gradual dropping off of the dominance of the horizontal line of the orders, and the adaptation of the dominant vertical line, with all its pinnacles and other accessories.

There are two grand, distinct families, so to speak, in architectural style, — Classic and Gothic; and as Mythology and Christianity — their respective parents — do not, cannot mix, neither can their children intermarry. The offspring generally possess the vices of both and the virtues of neither.

The Lord especially commanded the Israelites not to mix with the inhabitants of the Promised Land, — told them to cut them off; for He well knew if they mixed up with them, they would be corrupted, and be worse than heathen. But there is no reason why either one should not be wise enough to profit by the observation of the good as well as the bad qualities of the other, apply all the good he can without jeopardizing his individuality or integrity, but leave the other's faults to himself; half-Christianized heathen, as well as semi-heathenized Christians, are alike below par. What is true of

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morals in religion is as true of æsthetics in architecture; but thus far in our practice, in modern times, we have been either uncompromising heathen, bigoted Christians, or bushwhackers. As I have stated before, Victorian Gothic fills the bill admirably for our time, — if we want Gothic, but we don't always, — and as Gothic is peculiarly religious, we need something for other purposes. We love home, we quarrel, we trade, we dance and sing; hence we want private houses, court-houses, state-houses, theatres and opera-houses, jails, hotels, stores, etc., and we don't often like these different buildings to have a religious air about them; in fact, some of us have no religion at all, and the heathen side suits that kind of man better than the Christian. But there are certain difficulties in the way with classic in our nowaday buildings. I have pondered over and studied that subject for twenty years, and watched what the world was doing in this direction as much as possible in my small sphere, but came to the conclusion years ago, — and later observation has only confirmed former impressions, — that if there is ever a change in Renaissance "that will stick," it will be in the following direction. It is this: The combination of the ideas that have proved most successful, embodied in the various styles, and dressing up the whole in one direction. For instance, the proportions of the ordered column down to its details are finished. There is no use of wasting time or skill here. The Romans gave us the arch, and emphasized the key for it — locked it. Romanesque starts the arch direct from the column, and does not emphasize the key, because it was comprehended that all arch-stones are keys, they all lock alike. Here the arch looks as though it were less than a semicircle; an optical delusion, hence the Moors stilted the arch. Thus far the column is round or a square pier. The Gothic, with its groined arch and buttressing system, gives us the pointed arch and clustered column, tied together by the band-mouldings, and distinctly emphasizes the vertical line.

Now the conditions of the present and those of yore differ mainly in the variety of functions of our buildings. When we build a large building, it must have (if possible under one roof) a great number of rooms for various purposes, some large, others small, each complete within itself (with all modern improvements). This necessitates the cutting up of the building into many parts, of various sizes and shapes, and many stories, thus giving us an immense number of window and door openings, that should be wide and short, for the higher the story, the more steps there are to climb (elevators don't always do), and we don't like to climb more than we must. To fill all these conditions in common classic reduces the sizes of the columns enough to kill them, and we get a series of strongly emphasized horizontal lines by the various cornices, nearly equidistant from each other and of equal force, consequently making proportion impossible, and giving the façade a look of a lot of ready-made parts piled one on top of the other; for in classic, when you get to the top of cornice and parapet, you are done; if you want anything more, a new start has to be made. I believe to the Genoese belongs the honor of the first step in the right direction, *i. e.*, they put two stories of the building into one of the façade, but in a four-story building a cornice runs right through the middle of the building, dividing it into two equal parts, again ruining proportion. As nature is the archetype of all art, we should divide our building into three main divisions, making one whole: (1) Basement and foundation; (2) the main stories; and (3) the roof; in the first, we should express massiveness and strength; in the second, slender grace; and in the third, flowery elegance, — as in a tree, the root, the stem, and the foliage and flower. Now in Egyptian, Doric, and Tuscan, we see simplicity and strength expressed; in Ionic and Corinthian, grace; but in all the horizontal line is equally dominant, while in Gothic the vertical is dominant, giving that slender and graceful façade never found in classic. Now if we may take the dominating vertical line, dress it and manipulate it with Renaissance details, making the basement form the foundation for the rising column of the main building (stories), carry the shaft up to within its diameter of the cornice, so that the cap will drop down andstilt up the frieze as seen in many Egyptian examples, cut up so much of the bottom of the shaft into base, sub-base, etc., as is needed to give the column the proper number of diameters, let a pair of the main belt-courses between the stories run around the shafts dividing them into three main parts, two small and one large, as seen in the band of the Gothic cluster, tying the whole together; the vertical line by this means gives us loftiness; and the openings between, treated quite simply, give enough detail to look elaborate; our corner piers or pilasters, treated like columns, give us both mass and grace, and the caps of the columns become large enough to give an artist (I mean an artist) room to model a composition so effective that less than a hundred will decorate a building. This brings us up to the roof in main masses, as large or small as we need them, and we can use a flat roof or a steep one as we desire. If we want a steep one it should be broken up, to keep from looking clumsy. In the whole manipulation, however, avoid, if possible, the use of the pediment; it is seldom a success in modern Free Renaissance. A roof should ever look light and airy, and neither the hip-lines nor the ridge-lines should be unbroken, in order to soften the sky-line and give an appearance of life, like buds bursting out of a twig in early spring. But don't "frizzle" it. I inclose a rough sketch of one of the corner towers of Mr. Fuller's design treated in this manner to explain my meaning more fully;[1] we here find that by this method the integrity of the masses is preserved; it forms one main whole, divided into main divisions, and these again into subdivisions, to the third and fourth degree, and it can be decorated, if desirable, to an indefinite degree, or be left very simple without materially affecting the æsthetic effect of the building. Had the building been treated in this manner, the "present vigor" you lauded in your article could have been doubled, and as for refinement of detail, why, refinement of detail is not all fenced into the Gothic yard: at any rate, the building would not have needed a change of style, if it did need some change of plan; as it is, it will stand a lasting monument of the vicissitudes of political life in the New York of our time. As to the article in *Scribner*, I am not quite clear. I have not seen the building; what I know of it has been gathered from the controversy on the "change of style," the various plans and elevations, perpectives, photograph of model, etc., published in the *American Architect*, and these illustrations. While the old design has the ordinary faults of the treatment of Renaissance common in our time, the dome shows some masterly handling, such as in the remodelled design is not an abundant commodity. I am forcibly struck by the lack of proportion in form, and force in the lines, the want of ingenuity in the transition, the crudeness and feebleness (in design) of the over-abundant and pointless decoration. There is here a closer approach to Mr. Ruskin's "Sculptured Flail" idea than anything I have seen. We are here directed in derision to a little piece of the original elevation of Mr. Fuller's design on its own merits. Except "under the reporters' gallery" and "the staircase," it outranks the whole series; it is at least sober and correct, and that is more than I can say of most of them; but a good copy of a good thing is ever preferable to a weak original. In order to be the better understood and to give the reasons for these forcible expressions, allow me a few words upon decoration.

Artistic decoration is supposed to have a twofold duty to perform, — first to decorate and then to tell a story; the first is to give richness in effect to the structure, space, or fabric, that would otherwise be simple, plain, or crude. The East Indians and Persians have given us some wonderful effects in color in their stuffs, and the Moors will probably never be excelled, if reached, in the decoration of wall spaces. The Koran having forbidden the imitation of everything under the sun, all Mohammedan decorations are color and line effects only, without any meaning except in the inscriptions. The forms of their ornaments are designed mainly with a view to placing the various colors and tints in such juxtaposition that by their complementaries each would be enhanced, thus producing an effect that borders on the wonderful, an especial beauty lying in the subtlety of their lines. Plastic decoration (color decoration too), except in the before-mentioned cases, becomes an art only when it becomes expressive of an idea, when it is a crystallized thought, when you can read it like a book, whether it be given in animate or inanimate nature. A large building decorated artistically, as before stated, will give indefinite pleasure to a cultivated mind. The more one looks at it the more he will find to admire in it; one cannot take it all in at once; while a building decorated till one cannot rest, with gold and ornaments containing no idea, receives but one glance, is called magnificent, is let go, and is never looked at after. One glance is enough; whenever you look at it again your mind says at once: "Oh, I've seen that before." Thus Mr. Hunt's few months' work will give "food for the mind" for hours and hours, to innumerable people, who will give to all the other decorations in the building about fifteen minutes apiece; for meaning, throughout all these decorations, is more conspicuous by its absence than its excellence, a rare chance having been thrown away by the "untreated wall" of the main front, of all places the one that should have been decorated. What a splendid effect and how appropriate would have been a historical frieze in bas-relief across there, say "the Knickerbockers," if nothing else could have been found. Darley would have found something for it. I can hardly think that the illustrations do some of the work justice; taking, for instance, the mantel-piece, a clumsy composition as a whole, with two nondescripts on top, the only thing successful about which is that they look fierce, suggesting that, like the Pompeian *cave canem*, they were to warn people against going there, instead of being figures with an expression to invite the timid stranger to come near; and the modelling looks for all the world as though they had been cut out with a hatchet and sand-papered off; the ordinary carving to be seen in New York or Boston so far outranks the illustrations that I cannot convince myself that the illustrations do justice to the work, when the artist authors talk learnedly about refinement of details. In the wooden brackets supporting the ceiling timbers, of the "superior court room," I see the counterpart of the Quaker chair; it is honest but Quakerish, and does not fit into the kind of society it finds in that room, on either walls or ceiling. Looking at the wall-patterns on the "golden corridor," I consider the artistic subtlety of the lines and think of the barbaric Moors and their Alhambra. There is, indeed, altogether too much decoration, and that trifling and effeminate in its character.

In the change of architects, the building fell into the hands of the Philistines, one-sided men, who, though very strong as specialists, (for I don't know anything that outranks Trinity Church in this country), are yet the wrong men in this instance, for they had no sympathy for, and very little skill in, the style of the work that already existed (see the front dormer with the little columns right on top of the cap of the lower column, also the decoration of the pediment); they are on a par with Sir Christopher Wren, when he pulled down

[1] We regret to be obliged to omit our correspondent's sketch, executed as it is in a manner to which our process of reproduction is not suited. — EDS.

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one of the finest examples of English Gothic and replaced it, — well, with the present St. Paul's, whose two bell-towers stood alone as the ugliest things extant, until they found their peers in the corner pinnacles of the new dome. He believed in classic as devoutly as our Albany folks in Gothic, proving the old German saw in Swiss dialect that says: "*Des Dings, des so rum goht, goht so rum, au juhee.*" When the smoke of battle has blown away and we are all gone, perhaps before that, for we live fast in this country, there will be another remodelling; there will be a time when the New York mind, so fastidiously cultivated that it can endure nothing except what happens to be in fashion for the time being, will endure this no longer. A notable case just now is St. Mark's, in Venice, and the whole civilized world is crying out with united voice, "Woodman, spare that tree!" When that time comes for the Albany Capitol, and it most assuredly will, for the new work is even now not on a par with the better English Victorian Gothic, to say nothing of the barbarous idea of planting Romanesque on Renaissance, the cry will be, "Woodman, sail in."

With the hope of not having wearied you or my respected readers, I am, sir, Your most obedient servant,

John Moser, F. A. I. A.

PRELIMINARY DRAWINGS.

Boston, December 20, 1879.

To the Editor of the American Architect:

My dear Sir, — A question has arisen in regard to the meaning of the term "preliminary drawings."

Plans have been prepared to a scale of $\frac{1}{8}$ "and $\frac{1}{16}$" and rendered in ink, giving several schemes for proposed alterations, and with them estimates of their respective cost, to be laid before the owners for the purpose of assisting their minds in determining what to do. The sketches were ordered by the owners, but upon their completion the idea of building was temporarily abandoned.

The owners wrote, upon receiving the architect's bill for 1 % commission on the proposed cost, "that preliminary drawings were drawings made at the initiation of proceedings *determined upon*," and objected to the form of the bill on the ground that they had never decided actually to build.

Will you please tell me whether the amount of the commission should be altered by the fact of the proceedings being or not being determined upon before the plans were ordered, and give me the definition of the term "preliminary drawings," and oblige

Yours truly, "Architect."

PUBLICATIONS RECEIVED.

Draftman's Manual. "How can I learn Architecture?" Hints to Enquirers and Directions in Draftmanship. By F. T. Camp, architect. New York, 1879.

NOTES AND CLIPPINGS.

The Materials for Government Buildings. — It is subject for regret that Mr. Murch's resolution to authorize the Committee on Public Buildings and Grounds to inquire into all matters pertaining to the preparation and furnishing of materials for the construction of government buildings, which was introduced in the House of Representatives, December 12, has been tabled.

Judgment against an Architect. — In the case of Mr. Hodgson, an architect of Indianapolis, against the county, for increased compensation in building the new court-house, Judge Elliott, of the Superior Court, gave judgment on December 17 for the county. Mr. Hodgson claimed a percentage on the cost of the building above the estimated cost, while his contract was for five per cent of that amount, and to be no more, whatever the total cost should be. The building will cost fully double the estimate. Mr. Hodgson sued for $34,000.

Archæological Discoveries in New Mexico. — Among the trophies which Professor Stephenson of the Hayden Survey has brought back from New Mexico, where he has spent the past season in making collections for the Smithsonian Institution at Washington, are two gods, finely chiselled, and looking like Egyptian specimens. Their features are finely cut, and traces of paint are still found on their faces. They are both supplied with outstretched wings, and Professor Stephenson says they were probably brought into the country by the Spaniards a few centuries ago. Professor Stephenson has obtained specimens of pottery bearing a close resemblance to that unearthed in the ruins of the Old World, and also secured the secret of its manufacture from the Indians, who still make it in New Mexico. One curious result of his visit is the conviction he entertains that the so-called Aztecs never existed. He is satisfied that they are a myth, and that the tribes known as the "Cliff-dwellers" are to be credited with all the romance which has attached to the Aztecs. He says that buried towns and cities are numerous in New Mexico, and that relics of their existence and the state of their civilization are practically inexhaustible.

The Original Via Sacra. — A correspondent of the *London Times* writes that the excavations have been extended along the whole of the area of the Via Sacra from the Temple of Antoninus and Faustina to the Arch of Titus, and from the Church of Saints Cosma and Damiano to the edge of the roadway in front of the Palace of the Cæsars, and that with the exception of where a narrow strip of the accumulation has been left, like a railway embankment across a valley, so as not to interrupt traffic, the whole line of the ancient roadway from near the Colosseum to the Temple of Antoninus and Faustina, and of the roadways thence to the base of the Capitoline Hill, can be traversed in their entire length. One can, therefore, walk along the whole line of the pavement of what was, as regards a considerable portion of its extent, the Via Sacra of the later empire, but of that period only. The Via Sacra along which Horace and his friend walked was an earlier and very different one, and it is possible now to see how students with the classic authors only as their guide have gone widely astray in their attempts to reconstruct the topography of the Via Sacra. Their great error has been the assumption that it followed one unvarying line from the days of Romulus till it was covered with débris and earth, and grass was growing above it. They have failed to consider the vicissitudes which the Via Sacra had undergone by conflagrations and other causes, and the great alterations which were made from time to time, not only in the aspect, but even in the outline, of the Forum, through edifices built and rebuilt around it or giving place to others, in the progress of time.

The Preservation of Iron Surfaces. — In a note on this subject Mr. C. Graham Smith says: The paints used for iron-work are of every description, name, and quality. The usual varieties employed for preserving it against corrosion may be divided into lead, iron oxide, silicate, and tar paints. Differences of opinion exist as to the relative merits of the first three descriptions, but the experience of three foremen painters connected with establishments in England is decidedly in favor of lead paints, when of good quality and mixed with good oil without spirits. Unfortunately, there are no reliable practical tests to insure good materials alone being used. Consequently, both the colors and the oils are often inferior in quality and much adulterated. For these reasons, and on account of cheapness, iron oxide paints are by some preferred. A little white lead mixed with red makes it go further and easier to work into corners. If the first coats are put on with pure red lead, owing to its weight, it is liable to run off; but the last coat should consist of red lead alone. The tar paints are more often used for iron-work which is not to be seen, such as water-pipes, floor-plates for bridges, and girders which are to be built into masonry on brickwork. It is cheap and answers well for such purposes and for sea-work, as it is said not to foul so readily as lead or other paints of a finer description. A good rough paint is made by heating coal tar and mixing with it finely sifted slaked lime, in the proportion of between half a pound and a pound of lime to a gallon of tar, adding sufficient naphtha to render it of a convenient consistency for laying on. This composition should be applied while hot, but not too hot. Do not keep it over the fire too long, or it will lose its essential oils. Some positions admit of the paint being sanded, in which case it should be done, as it adds to its durability. Before painting iron, give it a coat of boiled linseed oil applied hot. — *The Iron Age.*

The Cause of London Fogs. — Dr. Frankland has lately concluded an investigation into the cause of the persistency and irritating character of the fogs which afflict the large towns of England, a subject which is rather opportune just now. The fogs are not always a sign of dampness, as they occur in comparatively dry air. Dr. Frankland has ascertained that their persistency in a dry medium is due to a coating of coal oil, derived from coal smoke, upon the surfaces of the minute particles of water which compose fog, the oleaginous coating effectually preventing the evaporation of the water. The oleaginous liquids are discharged into the atmosphere in large quantities during the combustion of bituminous coal in fires. Dr. Frankland therefore concludes that by the substitution of smokeless coal, coke, or gas, for bituminous coal, town fogs would cease. This would be a consummation devoutly to be wished; but considering the vested interests which are concerned in the supplying and using of bituminous coals, and the national preference for blazing fires, the reformation is just as likely to come from the adoption of some of the as yet undiscovered means of heating. But much might be done if the gas companies were more enterprising. Apart from the inconvenience, it is waste of money to be using costly illuminating gas for heating, when a gas equally effective for that purpose, but far cheaper, could be obtained. Nor would it be requisite to have a double set of mains, as there are several methods by which such gas could be rendered illuminating at a cheap rate. — *The Architect.*

California Fire-Proof Rock. — In Sierra County, California, a ledge of rock exists that is singularly unaffected by the intensest heat and the most sudden plunges into water thereafter. It is stratified just right for easy quarrying. Water power is convenient, no dam being necessary, only a short flume. The rock is soft, yet tenacious, admirably adapted to sawing into blocks as desired. Furthermore, tests have been made of several years standing as to the excellence of the rock in furnaces, forges, and in chimney-backs, and the satisfaction is complete. A stage road passes within a few rods of the ledge, and the Central Pacific Railroad is but an easy day's drive away. This fire-proof rock can be fashioned and laid down by the mills of the Comstock, or supplied to the trade of this coast, for one fourth the cost of Milwaukee brick, while in many respects it is ten times better, as large blocks or peculiar shaped ones can be made at pleasure, thus saving expense of mortar while securing greater strength. — *Reno Gazette.*

The Durability of Timber. — As showing the durability of timber, the fact is cited that the piles of a bridge built by Trajan were found, after having been driven some sixteen hundred years, to be petrified four inches, the rest of the wood being in its ordinary condition. The elm piles under the piers of London Bridge have been in use more than seven hundred years, and are not yet materially decayed, and, beneath the foundation of Savoy Place, London, oak, elm, beech, and chestnut piles and planks were found in a state of perfect preservation, after having been there for six hundred and fifty years. Again, while taking down the old walls of Tunbridge Castle, Kent, England, there was found in the middle of a thick stone wall a timber curb which had been enclosed for seven hundred years; and some timber of an old bridge was discovered while digging for the foundations of a house at Windsor which must have been placed there prior to the year 1396. — *New York Sun.*

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